Pandering to Persuade

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An agent advises a principal on selecting one of multiple projects or an outside option. The agent is privately informed about the projects' benefits and shares the principal's preferences except for not internalizing her value from the outside option. We show that for moderate outside option values, strategic communication is characterized by pandering: the agent biases his recommendation toward "conditionally better-looking" projects, even when both parties would be better off with some other project. A project that has lower expected value can be conditionally better-looking. We develop comparative statics and implications of pandering. Pandering is also induced by an optimal mechanism without transfers.

A central problem in organizations and markets is that of a decision-maker (DM) who must rely upon advice from a better-informed agent. Starting with Crawford and Sobel (1982), a large literature studies the credibility of "cheap talk" when there are conflicts of interest between the two parties. This paper addresses a novel issue: how do differences in observable or verifiable characteristics of the available alternatives affect cheap talk about non-verifiable private information? In a nutshell, our main insight is that the agent's desire to *persuade* the DM ineluctably leads to recommendations that systematically *pander* toward alternatives that *look better*. We study how pandering affects strategic communication and its implications for market and organizational responses, including optimal mechanism design.

In any number of applications, a DM has partial "hard" or verifiable information about the options she must choose between. For instance, a corporate board deciding which capital investment project to fund has some prior experience about which kinds of projects are more or less likely to succeed; a firm that could hire a consultant to revamp its management processes knows which procedures are being implemented at other firms; or buyers can read product reviews. Yet, the

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agent — the CEO, consultant, or seller respectively — has additional "soft" or unverifiable private information about the options. Crucially, the available hard information can affect the DM's interpretation of the agent's claims about his soft information. The reason is that any hard information typically creates an asymmetry among the options from the DM's point of view. Our interest is in understanding how such asymmetry influences the agent's strategic communication of his soft information.

The incentive issues arise in our model because of a conflict of interest about an outside option, or status quo, that is available to the DM in addition to the set of alternatives that the agent is better-informed about. For instance, the outside option for a corporate board is to not fund any capital investment project, or for a buyer it could be to not purchase any product from the seller (or purchase from a different seller). The outside option is typically more desirable to the DM than the agent. In our baseline model, this is the only conflict of interest. More precisely, any alternative to the outside option has some value that is common to both the DM and the agent, but these values are each drawn from some distribution (which may be different for each alternative) and are private information of the agent. On the other hand, the agent derives no benefit from the outside option, whereas the DM gains some commonly-known benefit from choosing it. Equivalently, the DM bears a resource cost of implementing any of the alternatives to the outside option, but this cost is not internalized by the agent.

In this setting, the strategic problem facing the agent is to persuade the DM that some alternative is better than the outside option while at the same time inducing the DM to choose the (mutually) best alternative. This captures an essential feature of many applications, including each of the examples mentioned above.

Cheap-talk communication here takes the form of comparisons, i.e. in equilibrium, the agent's message can be interpreted as a recommendation about which alternative provides higher value and hence should be chosen by the DM.[1] Our central insight is that any observable differences between the alternatives — formalized as non-identical distributions of values — will often force the agent to systematically distort his true preference ranking over the alternatives. We show that the agent will sometimes recommend an alternative that is "*conditionally better-looking*" (in a sense explained below) even though he knows that it is in fact worse than some other alternative. This happens despite the fact that both the agent and the DM would be better off if the latter alternative were instead chosen. In other words, the agent systematically *panders* toward certain alternatives on the basis of publicly observable information. Although aware of the pandering distortion, the DM always accepts the agent's recommendation of the conditionally best-looking alternative in any influential equilibrium, while she is more circumspect when the agent recommends conditionally worse-looking alter-

[1] Comparative cheap talk was first studied by Chakraborty and Harbaugh (2007, 2010); our focus is distinct and complementary, as discussed in more detail later.

natives, in the sense that she sometimes chooses the outside option when such alternatives are recommended.

Despite the common interest the two parties have over the set of alternatives, the pandering distortion in communication is unavoidable when the conflict of interest over the outside option is not trivial. If the agent were to always recommend the best alternative, then a recommendation for certain alternatives would generate a more favorable assessment from the DM about the benefit of foregoing the outside option. Consequently, for moderate outside option values, the DM would accept the agent's recommendation of these alternatives but stick with the outside option when some other alternatives are recommended. This generates the incentive for the agent to distort recommendations. The incentive to distort becomes more severe when the value of the outside option to the DM is higher.

Building on this basic observation, we show how influential communication can take place in spite of the agent's incentive to pander, so long as the outside option is not too large. The logic is that if the agent recommends an alternative that would not be acceptable to the DM under a truthful ranking only when it is *sufficiently better* — not just better — than the others, it becomes more acceptable to the DM when recommended. Why would the agent distort his recommendation in this way? The incentive is generated by the DM's asymmetric treatment of recommendations: she accepts some recommendations with probability one but others with probability less than one. It is worth stressing that, for moderate outside options, it is precisely the fact that the agent panders in equilibrium which makes all of his recommendations persuasive; without pandering, some recommendations would never be accepted. In other words, endogenous discrimination by the agent against an alternative can benefit the alternative by making it credible to the DM when it is recommended.

After an illustrative example in Section I, we develop a general model in Section II. Section III identifies a key stochastic ordering condition for the distributions from which the value of each alternative is drawn. We show that when the ordering condition holds, the direction of pandering is systematic in any influential equilibrium of the cheap-talk game once the outside option is sufficiently high for the DM, i.e. when the agent truly needs to persuade the DM to forego the outside option. We also show that the degree of pandering rises with the outside option, up until a point where influential communication is no longer possible.

The stochastic ordering of alternatives can be intuitive in some cases, such as when it coincides with ex-ante expected values. But the opposite can sometimes be true: an alternative that has lower ex-ante expected value (and is even dominated according to first-order stochastic dominance or even in likelihood ratio) can nevertheless be the one that the agent panders toward. This highlights the economics of strategic communication in the present context: what matters is not the evaluation of alternatives in isolation, but rather in a *comparative ranking*, i.e. when an alternative is recommended over all others. In particular, what drives the direction of pandering is the ranking of the DM's posterior expectation about each alternative when the agent truthfully reveals that the alternative is better than all others. For this reason, we refer to alternatives being *conditionally* better- or worse-looking than others, and pandering is toward the conditionally better-looking alternatives.

Section III also explores various implications of the characterization of pandering. Of note is that the DM's ex-ante welfare can decrease when his outside option increases, and that conditionally worse-looking alternatives become more credible or acceptable to the DM when the slate of alternatives is stronger (formally, when the distribution of any alternative improves in the sense of likelihood-ratio dominance).

Section IV examines to what extent the DM can mitigate the cheap-talk distortion when she has commitment power. We study optimal mechanisms without transfers. We find that, under a mild regularity condition, if pandering arises in the cheap-talk game then even an optimal mechanism induces pandering, but to a lesser degree than under cheap talk. This implies that the pandering phenomenon identified in this paper is not driven by the DM's inability to commit, but rather by the asymmetry between the projects and the conflict of interest over the outside option. Furthermore, we show that the optimal mechanism can be implemented within a class of simple mechanisms, in particular by delegating decision-making to an appropriately-chosen intermediary who must then play the cheap-talk game with the agent. We also find that full delegation to the agent (Aghion and Tirole, 1997; Dessein, 2002) dominates pure communication with the DM whenever the latter involves pandering.

Although the model we focus on is stylized, it is straightforward to extend in a number of ways to suit different applications. The conclusion, Section V, briefly mentions a few of these directions, such as adding conflicts of interest even among the alternatives to the outside option. A number of appendices available online provide supplementary material.

This paper connects to multiple strands of literature. The logic of pandering is related to Brandenburger and Polak (1996).[2] They elegantly show how a manager who cares about his firm's short-run stock price will distort his investment decision towards an investment that the market believes is ex-ante more likely to succeed. However, their model is not one of strategic communication, but rather has an agent making decisions himself when concerned about external perceptions. As a result, we study a different set of issues, including various forms of commitment and other responses by the DM, and we shed light on a broader set of applications. Our analysis and findings are also more refined because of a richer framework.[3] For example, as already mentioned, in our setting the agent

[2]See also Blanes i Vidal and Moller (2007). Heidhues and Lagerlof (2003) and Loertscher (2010) study similar themes in the context of electoral competition.

[3]Their model has two states, two noisy signals, and two possible decisions. We have continuous and multi-dimensional state space, perfectly informative signals, and an arbitrary finite number of decisions. Moreover, the preferences for the agent in our model are more complex because he also cares about the benefit of the chosen alternative and not just about whether the outside option is foregone.

may pander toward an alternative with lower ex-ante expected value, which does not arise in Brandenburger and Polak (1996).

Crawford and Sobel (1982)'s canonical model of cheap talk has one-dimensional private information and a different preference structure than ours. Within the small but growing literature on multidimensional cheap talk (e.g., Battaglini, 2002; Ambrus and Takahashi, 2008; Chakraborty and Harbaugh, 2010), the most relevant comparison is with Chakraborty and Harbaugh (2007). They show how truthful comparisons can be credible across dimensions even when there is a large conflict of interest within each dimension, so long as there are common interests across dimensions. A key assumption for their result is (enough) symmetry across dimensions in terms of preferences and the prior.[4] Our analysis is complementary because we study the properties of influential communication when there is enough *asymmetry* across dimensions; this leads to a breakdown of truthful comparisons and instead generates pandering.[5]

As already noted, we show that pandering can arise not only under cheap-talk communication but also when the DM designs an optimal mechanism without transfers. This connects our paper to the literature on optimal delegation initiated by Holmstrom (1984).[6] Our setting is closest to Armstrong and Vickers (2010) and Nocke and Whinston (2011). The key difference is that those authors assume that after an alternative is recommended, the DM observes its value perfectly; if we were to make that assumption, our problem would become trivial because there are no conflicts of interest over the set of alternatives.

Finally, we note that although the notion of pandering may be reminiscent of various kinds of "career concerns" models,[7] the driving forces there are very different from the current paper. In those models, the distortions occur because the agent is attempting to influence the DM's beliefs about either his ability or preferences because of, implicity or explicitly, future considerations. In contrast, our model has no such uncertainty and no dynamic considerations; rather, the distortions occur entirely because the agent wishes to persuade the DM about her current decision. The logic here is also distinct from that of Prendergast (1993), where distortions occur because a worker tries to guess the private information of a supervisor when subjective performance evaluations are used.

[4]Chakraborty and Harbaugh (2010) do not require symmetry, but assume instead that the agent/sender has state-independent preferences, which in our setting would be equivalent to assuming that the agent does not care about which alternative is implemented. Our analysis relies crucially on the agent trading off the acceptance probability of an alternative with its value. In particular, pandering could never otherwise arise in an optimal mechanism.

[5]Levy and Razin (2007) identify conditions under which communication can entirely break down in a model of multidimensional cheap talk when the conflict of interest is sufficiently large. While this also occurs in our model for a large enough outside option, their result crucially relies on the state being correlated across dimensions, whereas we assume independence. More importantly, our focus is on the properties of influential communication when the outside option is not too large.

[6]Some recent contributions include Alonso and Matouschek (2008), Goltsman et al. (2009), Kovác and Mylovanov (2009), and Koessler and Martimort (2009).

[7]See, for example, Morris (2001), Canes-Wrone et al. (2001), Majumdar and Mukand (2004), Maskin and Tirole (2004), Prat (2005), and Ottaviani and Sorensen (2006).

I. An Example

Before introducing the general model, we first present a simple example that illustrates why pandering can be necessary for persuasion and how it works.[8] A decision-maker (DM) is faced with the choice between an outside option and two alternative projects. Her (von Neumann-Morgenstern) utility from the outside option is commonly known to be $b_0 > 0$. Each project $i \in \{1, 2\}$ provides her a utility of $b_i > 0$, but the value of (b_1, b_2) is the private information of an agent. The agent's utility from project i is also b_i, but he gets 0 from the outside option. Suppose b_1 is ex-ante equally likely to be either 1 or 7, whereas b_2 is equally likely to be either 4 or 6; their draws are independent. All aspects of the setting except the realization of (b_1, b_2) are common knowledge, and players are expected utility maximizers.

The agent would like to persuade the DM to choose one of the two projects, preferably the one with higher value, over the outside option. We are interested in the nature of communication when the agent makes cheap-talk recommendations to the DM. First, can communication be influential or persuasive? Second, are recommendations "truthful" in the sense that the agent always recommends the project with higher value to the DM? Third, if recommendations are biased or non-truthful, are they biased in favor of project two, which has a higher expected value, or in favor of project one, which has more upside potential?

To illustrate the main ideas, consider a simple game in which the agent recommends one of the two projects and the DM decides whether to accept the recommendation or vetoes it, in which case the outside option is implemented. The DM's strategy can be described by a vector (q_1, q_2), where $q_i \in [0, 1]$ is the probability with which the DM chooses project i when it is recommended. To avoid trivial cases, assume the outside option $b_0 \in (4, 6)$.

A necessary and sufficient condition for there to be an equilibrium where the agent recommends the project with higher value and the recommendation is always accepted is $b_0 \leq 5$. When $b_0 > 5$, if the agent were to always recommend the better project, it would be optimal for the DM to accept the recommendation when project one is recommended, but to veto it when project two is recommended. Notice that this is the case even though $\mathbb{E}[b_1] = 4 < \mathbb{E}[b_2] = 5$; what matters here, instead, is the conditional expectation of a project when it is ranked higher than the other. More precisely, $\mathbb{E}[b_1|b_1 > b_2] = 7 > \mathbb{E}[b_2|b_2 > b_1] = 5$. We say that even though project two is unconditionally more attractive than project one, project one is *conditionally better-looking.*

Is persuasion possible when $b_0 > 5$, given that truthful recommendations would not be incentive compatible? The answer is yes if $b_0 \in (5, 5.5)$, but it requires the agent to bias his recommendation toward project one, and the DM to sometimes, but not always, accept the agent's recommendation. In particular, it can be verified that there is a partially-informative equilibrium where the agent recommends

[8]We are grateful to Steve Tadelis for suggesting a related example.

the better project whenever $(b_1, b_2) \in \{(7,4),(7,6),(1,6)\}$, but recommends the inferior project one with positive probability when $(b_1, b_2) = (1,4)$. In turn, the DM's acceptance vector is $(q_1, q_2) = (1, 1/4)$, i.e. a recommendation for project one is accepted for sure whereas a recommendation for project two is only accepted with probability 1/4, with the outside option instead being chosen with probability 3/4. Since the agent is recommending project one whenever it is better but also sometimes when it is worse, we say that he is *pandering*, in the sense of biasing his recommendation toward the project that is conditionally better-looking.[9]

The logic driving the pandering equilibrium is as follows: by recommending project two whenever $(b_1, b_2) = (1,6)$ but only sometimes when $(b_1, b_2) = (1,4)$, the agent increases the DM's posterior about b_2 when he does in fact recommend project two. Thus, pandering toward project one makes recommendations of project two more acceptable. In turn, the DM must be more likely to follow a recommendation of project one than a recommendation of project two: otherwise, pandering toward project one will not be optimal for the agent given that he values implementing the better project. As b_0 increases from 5 to 5.5, the agent's pandering increases, i.e. he recommends project one with an increasing probability when $(b_1, b_2) = (1,4)$. This is because the agent's randomization when $(b_1, b_2) = (1,4)$ must be such that the DM's posterior expectation of project two when it is recommended equals b_0.[10]

When $b_0 > 5.5$, the outside option is always chosen in any equilibrium, i.e. $q_1 = q_2 = 0$. The reason is that when $b_0 > 5.5$, the degree of pandering needed to make project two acceptable to the DM when recommended renders project one unacceptable: the DM's posterior expectation of b_1 when project one is recommended drops below the value of outside option.[11]

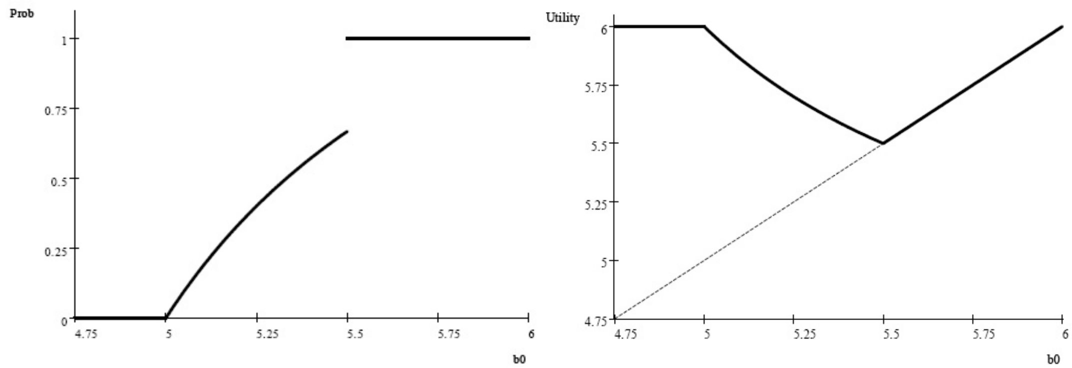
Figure 1(a) summarizes the above equilibrium description by plotting the probability with which the agent recommends project one when $(b_1, b_2) = (1,4)$. Figure 1(b) plots the corresponding ex-ante expected utility for the DM. For $b_0 < 5$, the DM's expected utility is constant at $\mathbb{E}[\max\{b_1, b_2\}] = 6$. When b_0 increases from 5 to 5.5, the DM's expected utility is strictly decreasing, because the agent's pandering is exacerbated by a higher outside option value: because of a lack of

[9]Given that $b_0 > 5$, any distortion in the agent's recommendation must be toward project one so long as either $q_1 > 0$ or $q_2 > 0$. To see this, note first that if $q_1 = q_2 > 0$, then the agent will recommend the better project, but as already discussed, this cannot be sustained in equilibrium. There also cannot be an equilibrium where $q_2 > q_1$, because then the agent will always recommend project two when $b_1 = 1$, in which case the DM must choose the outside option when project two is recommended (as $\mathbb{E}[b_2] = 5 < b_0$).

[10]This implies that when $(b_1, b_2) = (1,4)$, the agent must recommend project one with probability $\frac{2b_0-10}{b_0-4}$.

[11]If the agent recommends project one with probability p when $(b_1, b_2) = (1,4)$ and otherwise truthfully recommends the better project, the DM's expected payoff from choosing project one when it is recommended can be calculated as $\frac{12+p+2}{p+2}$. When $p = \frac{2b_0-10}{b_0-4}$ (cf. fn. 10), the DM's expected payoff from choosing project one is $\frac{8b_0-33}{2b_0-9}$. This is weakly larger than b_0 if and only if $b_0 \le 5.5$. Note that while any equilibrium must have $q_1 = q_2 = 0$ when $b_0 > 5.5$, there are many strategies for the agent which support this outcome. Also, while we have only discussed one equilibrium above for $b_0 < 5.5$, it is in fact the interim Pareto dominant equilibrium.

commitment, a more valuable outside option harms the DM in this region. Finally, when $b_0 > 5.5$, the DM always chooses the outside option, so her expected utility is just b_0.



(a) Probability of recommending project one when $(b_1, b_2) = (1, 4)$.

(b) Ex-ante expected utility for DM.

Figure 1. – Pandering in the Binary Example.

It is worth noting that if the DM could commit to delegating the project choice to the agent, her expected payoff from delegation would be $\mathbb{E}[\max\{b_1, b_2\}] = 6$, so she strictly benefits from doing so if and only if $b_0 \in (5, 6)$. One can also show in this example that if the DM could commit to an arbitrary mechanism without transfers, then for $b_0 \in (5, 6.6)$, the optimal mechanism can be implemented by asking the agent to recommend a project and committing to exactly the same acceptance vector as in the equilibrium of the game without commitment. In other words, the DM commits to implementing project one whenever it is recommended while only implementing project two with probability 1/4 when recommended (and implementing the outside option with remaining probability). The difference, however, is that when the DM has committed to this acceptance rule, the agent responds by truthfully recommending the better project rather than pandering.[12] This mechanism gives the DM an expected payoff of 6.6, which is higher than from full delegation. The DM's cost of inducing truthful recommendations is the "information rent" she gives the agent by accepting project two sometimes even though she would ex-post prefer not to. When $b_0 > 6.6$, the optimal mechanism for the DM is to always choose the outside option because it is no longer worth paying the information rent.

[12]The agent is still indifferent between the two projects when $(b_1, b_2) = (1, 4)$, but the crucial point is that he need not randomize between recommendations to preserve the DM's incentives to follow the acceptance rule. In fact, the agent's incentive can be made strict by choosing $q_2 = 1/4 + \varepsilon$ for any $\varepsilon > 0$. Formally, the optimal acceptance rule is obtained by solving for the optimal direct-revelation mechanism subject to incentive compatibility constraints for each of the four values of (b_1, b_2). Details are available on request.

In the remainder of the paper, we study a richer model where each project's value is drawn from a continuous distribution. We show that suitable versions of the above insights continue to apply, and we develop additional insights. Inter alia, we will study general cheap-talk communication from the agent and deal with the issue of multiple equilibria, identify conditions on the projects' value distributions under which pandering is systematically in the direction of a particular project, perform comparative statics in the outside option and the projects' value distributions, and show that unlike in this binary example, pandering also generally arises even when the DM can commit to mechanisms without transfers.

II. The Model

A. Setup

There are two players: an agent ("he") and a decision-maker (DM, "she"). The DM must make a choice from the set $\{0, 1, \ldots, n\}$, where $n \geq 2$. It is convenient to interpret option 0 as a status quo or outside option for the DM, and $N := \{1, \ldots, n\}$ as a set of alternative projects. Both players enjoy a common payoff if one of the alternative projects is chosen, but this value is private information of the agent. Specifically, each project $i \in N$ yields both players a payoff of b_i that is drawn from a prior distribution F_i and privately observed by the agent. (Throughout, payoffs refer to von Neumann-Morgenstern utilities, and the players are expected utility maximizers.) On the other hand, it is common knowledge that if the outside option is chosen, the agent's payoff is zero (a normalization), while the DM's payoff is $b_0 > 0$.

We maintain the following assumptions on $(F_1, \ldots, F_n)$ and b_0:

(A1) For each $i \in N$, Support$[b_i] = [\underline{b}_i, \overline{b}_i]$, with $0 \leq \underline{b}_i < b_0 < \overline{b}_i \leq \infty$.

(A2) For each $i \in N$, F_i is absolutely continuous with a density f_i that is strictly positive on $(\underline{b}_i, \overline{b}_i)$, and $\mathbb{E}[b_i] < \infty$.

(A3) For each pair $i, j \in N$ with $i \neq j$, $\exists \alpha > 0$ such that $\mathbb{E}[b_i | b_i > \alpha b_j] > b_0$.

(A4) For any $i, j \in N$, F_i and F_j are independent distributions, but they need not be identical.

After privately observing $\mathbf{b} := (b_1, \ldots, b_n) \in \mathcal{B} := \prod_{i=1}^{n} [\underline{b}_i, \overline{b}_i]$, which we also refer to as the agent's **type**, the agent sends a cheap-talk or payoff-irrelevant message to the DM, $m \in M$, where M is a large space (e.g. $M = \mathbb{R}^n_+$). The DM then chooses a project $i \in N \cup \{0\}$. Aside from the realization of $\mathbf{b}$, all aspects of the game are common knowledge. We study (perfect) Bayesian equilibria.

B. Discussion of the assumptions

Since both the agent and the DM derive the same payoff, b_i, for any $i \in N$, their interests in choosing between the n projects are completely aligned. Assumption (A1) implies that each project has a positive chance of being better for the DM than the outside option; this is without loss of generality because otherwise a project would not be viable. More importantly, (A1) also implies that the agent strictly prefers any project to the outside option, whereas with positive probability, each project is worse than the outside option for the DM. Thus, the conflict of interest is entirely about the outside option: the agent does not internalize the opportunity cost to the DM of implementing a project. What is essential here is that the DM values the outside option more than the agent relative to the alternative projects; allowing for $\underline{b}_i < 0$ complicates some details of the analysis without adding commensurate insight.[13]

Assumption (A2) is for technical reasons. Assumption (A3) means that the DM's posterior assessment of any project $i \in N$ becomes more favorable than the outside option if project i is known to be sufficiently better than any other project $j \in N \setminus \{i\}$. Note that given (A1), this is automatically satisfied if $\underline{b}_i > 0$ for all i. The role of (A3) will be clarified later (see fn. 25), but intuitively, it ensures that if the agent only recommends a project when it is sufficiently better than some other, the DM will wish to implement it.[14]

The independence portion of Assumption (A4) is not essential for our main results, but it makes some of the analysis more transparent. (A4) also allows for non-identical project distributions. Since this is central to our main results, it is worth discussing at some length. Our preferred interpretation is that each project i has some attributes that are publicly observed and some attributes that are privately observed by the agent. For example, if the projects represent academic job candidates, the two components may respectively be a candidate's vita and the hiring department's evaluation of her future trajectory. Both aspects can be viewed as initially stochastic, with the distribution F_i capturing the residual uncertainty about i's value *after* the observable components have been realized and observed by both DM and agent. Typically, projects will have different realizations of observable information, so that even if projects i and j are initially symmetric, there will be an asymmetry in the residual uncertainty about them, so that $F_i \neq F_j$. One can therefore view the distribution of b_i's as parameterized by some observable information v_i, i.e. $F_i(b_i) \equiv F(b_i; v_i)$. The following are two parameterized families of distributions that serve as useful examples:

[13]If $b_i < 0$, then the agent will prefer the outside option over project i. For our purposes, the situation can equivalently be modeled by generating a new distribution for project i, say $\tilde{F}_i$, with support $[0, \overline{b}_i]$ and distribution as follows: $\tilde{F}_i(x) = 0$ for all $x < 0$ and $\tilde{F}_i(x) = F_i(x)$ for all $x \geq 0$. Since it is credible for the agent to reveal that $b_i < 0$, the strategic communication problem concerns $\tilde{F}_i$. The resulting atom at zero in $\tilde{F}_i$ can be accommodated in the analysis.

[14]In the context of the example in Section I, this is analogous to requiring that $b_0 < 6$: otherwise, no amount of pandering toward project one will be enough to make project two acceptable to the DM when recommended.

- **Scale-invariant uniform distributions**: b_i is uniformly distributed on $[v_i, v_i + \overline{u}]$ for some $\overline{u} > 0$ and $v_1 \geq v_2 \geq \cdots \geq v_n = 0$.[15]
- **Exponential distributions**: b_i is exponentially distributed on $[0, \infty)$ with mean v_i, where $v_1 \geq v_2 \geq \cdots \geq v_n > 0$.

In certain applications, rather than some attributes being directly observed by the DM, it may be that all aspects are privately observed by the agent, but there are two kinds of information: verifiable or "hard" information, and unverifiable or "soft" information. Under a monotone likelihood ratio condition that is satisfied by the above two families but is considerably more general, analogues of standard "unraveling" arguments (Milgrom, 1981; Seidmann and Winter, 1997) can be used to support an outcome where the agent fully reveals the verifiable attributes. It is then effectively as though the DM directly learns the realizations of these attributes, and again F_i captures the residual soft information about project i. Online Appendix F formalizes this point.

III. Pandering to Persuade

Hereafter, in the main text, we restrict attention to $n = 2$, i.e. there are only two alternative projects to the outside option; this substantially simplifies the exposition while conveying all the main insights. We will comment briefly on $n > 2$ toward the end of this section but relegate the formal analysis to online Appendix D. Given that $n = 2$, we use the notation $-i$ to denote project two if $i = 1$ and project one if $i = 2$.

A. Preliminaries

A strategy for the agent is represented by $\mu : \mathcal{B} \to \Delta(M)$, while a strategy for the DM is $\alpha : M \to \Delta(N \cup \{0\})$, where $\Delta(\cdot)$ is the set of probability distributions. Since the game is one of cheap talk, the objects of interest are equilibrium mappings from the agent's type to the DM's (mixtures over) decisions rather than what messages are used per se. Say that two equilibria are **outcome-equivalent** if they have the same such mapping for almost all types. A pair of value distributions (F_1, F_2) is said to be **generic** if $\mathbb{E}[b_1] \neq \mathbb{E}[b_2]$ and, moreover, provided that there are at most a countable number of pairs (x, y) such that $x > y > 0$ and either $\mathbb{E}[b_2 | x b_1 > b_2 > y b_1] = \mathbb{E}[b_1 | x b_1 > b_2 > y b_1]$ or $\mathbb{E}[b_2 | b_2 > y b_1] = \mathbb{E}[b_1 | b_2 > y b_1]$.[16]

[15] For this family of distributions, it is without loss of generality to set $v_n = 0$, because one can just subtract v_n from the values of all projects and the outside option.

[16] To interpret the second requirement, consider a two-dimensional picture where b_2 is the vertical axis and b_1 is the horizontal. For any $x > y > 0$, the type space $\mathcal{B}$ is partitioned into three regions by the two lines $b_2 = x b_1$ and $b_2 = y b_1$; call them respectively the upper, middle, and lower events. The distributions are non-generic if there are an uncountable number of (x, y) pairs such that the conditional expectation of b_2 in the middle event equals the conditional expectation of b_1 in the middle event. Analogously, the distributions are non-generic if there are an uncountable number of values of y such that the type space $\mathcal{B}$ can be partitioned into two regions by the line segment $b_2 = y b_1$ such that the two conditional expectations are equal in the upper event.

We begin by establishing a result that substantially simplifies the analysis of equilibria.

LEMMA 1: *Fix generic distributions* (F_1, F_2) *and a generic outside option* b_0*. Then any equilibrium is outcome-equivalent to one in which: (i) the agent plays a pure strategy whose range consists of at most two messages; (ii) the DM's strategy is such that following any message* m*, if project* $i \in \{1,2\}$ *is chosen with positive probability then project* $-i$ *is chosen with zero probability.*

The proof of this result and all others not in the text can be found either in Appendix A or online Appendix B.

In light of Lemma 1, we focus hereafter on equilibria where the agent chooses a message $i \in N = \{1,2\}$, which is convenient to interpret as the agent *recommending* project i or *ranking* project i above $-i$. In turn, the DM's strategy can now be viewed as a vector of **acceptance probabilities**, $\mathbf{q} := (q_1, q_2) \in [0,1]^2$, where q_i is the probability with which the DM implements project i when the agent recommends project i. In other words, if an agent recommends project i, a DM who adopts strategy $\mathbf{q}$ accepts the recommendation with probability q_i but rejects it in favor of the outside option with probability $1 - q_i$.

Given any acceptance vector $\mathbf{q}$, the optimal strategy μ for the agent has

$$\mu_i(\mathbf{b}) = 1 \text{ if } q_i b_i > q_{-i} b_{-i}, \tag{1}$$

where $\mu_i(\mathbf{b})$ denotes the probability with which a type $\mathbf{b}$ agent recommends project i. Accordingly, in characterizing an equilibrium, we can just focus on the DM's acceptance vector, $\mathbf{q}$, with the understanding that the agent best responds according to (1). For any equilibrium $\mathbf{q}$, the optimality of the DM's strategy combined with (1) implies a pair of conditions for each project i:

$$q_i > 0 \implies \mathbb{E}\left[b_i \mid q_i b_i \geq q_{-i} b_{-i}\right] \geq \max\left\{b_0, \mathbb{E}\left[b_{-i} \mid q_i b_i \geq q_{-i} b_{-i}\right]\right\}, \tag{2}$$

$$q_i = 1 \impliedby \mathbb{E}\left[b_i \mid q_i b_i \geq q_{-i} b_{-i}\right] > \max\left\{b_0, \mathbb{E}\left[b_{-i} \mid q_i b_i \geq q_{-i} b_{-i}\right]\right\}. \tag{3}$$

Condition (2) says that the DM accepts recommendation of project i only if she finds it weakly better than the outside option as well as the other (unrecommended) project, given her posterior which takes the agent's strategy (1) into consideration. Similarly, (3) says that if she finds the recommended project to be strictly better than both the outside option and the other (unrecommended) project, she must accept that recommendation for sure. These conditions are clearly necessary in any equilibrium;[17] the following result shows that they are also sufficient.

LEMMA 2: *If an equilibrium has acceptance vector* $\mathbf{q} \in [0,1]^2$*, then* (2) *and* (3) *are satisfied for all projects* i *such that* $\Pr\{\mathbf{b} : q_i b_i \geq q_{-i} b_{-i}\} > 0$*. Conversely, for*

[17]Strictly speaking, the necessity holds for those projects that are recommended with positive probability on the equilibrium path, i.e. when $\Pr\{\mathbf{b} : q_i b_i \geq q_{-i} b_{-i}\} > 0$.

any $\mathbf{q} \in [0,1]^2$ *satisfying* (2) *and* (3) *for all* i *such that* $\Pr\{\mathbf{b} : q_i b_i \geq q_{-i} b_{-i}\} > 0$, *there is an equilibrium where the DM plays* $\mathbf{q}$ *and the agent's strategy satisfies* (1).

For expositional convenience, we will focus on equilibria with the property that if a project i has ex-ante probability zero of being implemented on the equilibrium path, then the DM's acceptance vector has $q_i = 0$. This is without loss of generality because there is always an outcome-equivalent equilibrium with this property: if $q_i > 0$ but the agent does not recommend i with positive probability, it must be that $q_i \bar{b}_i \leq q_{-i} \underline{b}_{-i}$, so setting $q_i = 0$ does not change the agent's incentives and remains optimal for the DM with the same beliefs.

We will refer to an equilibrium with $\mathbf{q} = \mathbf{0} := (0, 0)$ as a **zero equilibrium**. If $q_i = 1$, we say that the DM **rubber-stamps** project i, since she chooses it with probability one when the agent recommends it. If the DM rubber-stamps both projects, it is optimal for the agent to be **truthful** in the sense that he always recommends the better project. It is important to emphasize that truthful here is only in the sense of rankings, not in the sense that the agent fully reveals the cardinal values of the projects. Notice that in any non-zero equilibrium, it is optimal for the agent to be truthful if and only if the DM rubber-stamps both projects. Accordingly, we will say that a **truthful equilibrium** is one where $\mathbf{q} = \mathbf{1} := (1, 1)$.[18] An equilibrium is **influential** if $\min\{q_1, q_2\} > 0$, i.e. both projects are implemented on the equilibrium path. We say that the agent **panders toward** i if $q_i > q_{-i} > 0$. The reason is that under this condition, the agent will recommend project $-i$ if it is sufficiently better than i, but he distorts his recommendation toward i because he will not recommend $-i$ unless $b_{-i} > \frac{q_i}{q_{-i}} b_i$. Note that we do not consider $q_i > 0 = q_{-i}$ as pandering toward i because in this case the agent can never get project $-i$ implemented. An equilibrium is a **pandering equilibrium** if there is some i such that the agent panders toward i in the equilibrium. Finally, say that an equilibrium $\mathbf{q}$ is **larger** than another equilibrium $\mathbf{q}'$ if $\mathbf{q} > \mathbf{q}'$,[19] and **$\mathbf{q}$ is better than $\mathbf{q}'$** if $\mathbf{q}$ Pareto dominates $\mathbf{q}'$ at the interim stage where the agent has learned his type but the DM has not.

B. Main results

The fundamental logic of pandering to persuade is very general because so long as the two projects are not identically distributed, the DM's beliefs when the agent is truthful will typically favor one project, say project one, over the other. Our goal is to identify when there is a systematic pattern of pandering, namely to understand what attributes of the projects — in terms of their value distributions — cause one project to be pandered toward regardless of the selection of

[18]There can be a zero equilibrium where the agent always recommends the better project; this exists if and only if for all $i \in N$, $\mathbb{E}[b_i | b_i > b_{-i}] \leq b_0$. We choose not to call this a truthful equilibrium.

[19]Throughout, we use standard vector notation: $\mathbf{q} > \mathbf{q}'$ if $q_i \geq q_i'$ for all i with strict inequality for some i; $\mathbf{q} \gg \mathbf{q}'$ if $q_i > q_i'$ for all i.

equilibrium and the value of the outside option. Moreover, we would like systematic comparative statics, for instance how the outside option affects the degree of pandering. Such analysis requires an appropriate stochastic ordering of the projects' value distributions.

DEFINITION 1: *The two projects are* ***strongly ordered*** *if*

$$\mathbb{E}[b_1|b_1 > b_2] > \mathbb{E}[b_2|b_2 > b_1], \tag{R1}$$

and, for any $i \in \{1, 2\}$,

$$\mathbb{E}[b_i|b_i > \alpha b_{-i}] \text{ is nondecreasing in } \alpha \text{ for } \alpha \in (0, \overline{b}_i/\underline{b}_{-i}). \tag{R2}$$

The first part of the strong ordering condition is mild because when $F_1 \neq F_2$, generally $\mathbb{E}[b_1|b_1 > b_2] \neq \mathbb{E}[b_2|b_2 > b_1]$; in this sense, (R1) can be viewed as a labeling convention. Given the labeling, we refer to project one as the **conditionally better-looking project** because it would generate a higher posterior expectation for the DM if the agent were to truthfully recommend the better project.

Now consider (R2): when α increases, there are two effects on $\mathbb{E}[b_i|b_i > \alpha b_{-i}]$. On the one hand, for any given realization of b_{-i}, the conditional expectation of b_i increases; call this a *conditioning* effect. On the other hand, there is a countering *selection* effect: as α rises, lower realizations of b_{-i} become increasingly likely in the event $\{\mathbf{b} : b_i > \alpha b_{-i}\}$. (R2) requires the conditioning effect to at least offset the selection effect.[20] The following lemma provides a useful sufficient condition for this property.

LEMMA 3: *Condition (R2) for* $i \in \{1, 2\}$ *is satisfied if* $bf_{-i}(b)/F_{-i}(b)$ *is non-increasing in* b *for* $b \in (\underline{b}_{-i}, \overline{b}_{-i})$.

Thus, (R2) is assured to hold for $i = 1, 2$ if the reverse hazard rate of project $-i$, f_{-i}/F_{-i}, decreases sufficiently fast.[21] While this is more demanding than log-concavity of F_j, online Appendix G verifies the sufficient condition for a variety of familiar families of distributions including Pareto distributions, Power function distributions (which subsume uniform distributions), Weibull distributions (which subsume exponential distributions), and Gamma distributions.[22]

Our first main result is:

[20]Perhaps counter-intuitively, the selection effect can dominate the conditioning effect so that $\mathbb{E}[b_i|b_i > \alpha b_{-i}]$ can decrease when α increases. This is easily seen in a discrete example: suppose b_1 and b_2 are both uniformly distributed on $\{3, 6\}$ and $\{1, 4\}$ respectively. Then $\mathbb{E}[b_1|b_1 > b_2] = \frac{1}{3}(3) + \frac{2}{3}(6) = 5$, while $\mathbb{E}[b_1|b_1 > 2b_2] = \frac{1}{2}(3) + \frac{1}{2}(6) = 4.5$.

[21]Consider again the example of fn. 20. The reverse hazard rate of project two is strictly decreasing (from 1 to 1/2) but not sufficiently fast ($\frac{b_2 f_2(b_2)}{F_2(b_2)}$ rises from 1 to 2).

[22]It is worth noting that the sufficient condition in Lemma 3 does not require the density f_{-i} to be non-increasing. In particular, the family of Weibull distributions includes densities that are strictly increasing over a portion of the domain. For Gamma distributions, we provide an analytical proof only for those densities that are non-increasing.

THEOREM 1: *Assume that the projects are strongly ordered.*

1) *If* $\mathbf{q}$ *is an equilibrium with* $q_1 > 0$*, then* $q_1 \geq q_2$*; if in addition* $q_2 < 1$*, then* $q_1 > q_2$*.*

2) *There is a largest equilibrium,* $\mathbf{q}^*$*, in the sense that for any other equilibrium* $\mathbf{q} \neq \mathbf{q}^*$*,* $\mathbf{q}^* > \mathbf{q}$*. Moreover,* $\mathbf{q}^*$ *is the best equilibrium, i.e. it interim Pareto dominates any other equilibrium. There exist* $b_0^* := \mathbb{E}[b_2|b_2 > b_1]$ *and* $b_0^{**} \geq b_0^*$ *such that:*[23]

   a) *If* $b_0 \leq b_0^*$*, then the best equilibrium is the truthful equilibrium,* $\mathbf{q}^* = (1,1)$*.*

   b) *If* $b_0 \in (b_0^*, b_0^{**})$ *, the best equilibrium is a pandering equilibrium,* $\mathbf{q}^* = (1, q_2^*)$ *for some* $q_2^* \in (0,1)$*. Moreover, in this region, an increase in* b_0 *strictly increases pandering in the best equilibrium (i.e.* q_2^* *strictly decreases) and strictly decreases the interim expected payoffs of both players in the best equilibrium.*[24]

   c) *If* $b_0 > b_0^{**}$*, only the zero equilibrium exists,* $\mathbf{q}^* = (0,0)$*.*

Part 1 of the theorem implies that in any equilibrium where project one is recommended on path, either the equilibrium is truthful or there is pandering toward project one, which is conditionally better-looking than project two. Part 2 characterizes the *largest* equilibrium, which is reasonable to focus on; among other things, it is the *best* equilibrium. The possible values of the outside option can be partitioned into three distinct regions: when b_0 is low, the best equilibrium is truthful; when b_0 is intermediate, it is a pandering equilibrium where project one is accepted with probability one whereas project two is accepted with interior probability; and when b_0 is large enough, only the zero equilibrium exists.[25] The underlying logic of the pandering equilibrium is similar to that of the example in Section I, but there is one notable difference in how pandering manifests here. Since the project value distributions are continuous, the agent has an essentially unique best response to any acceptance vector $\mathbf{q} > \mathbf{0}$, which is to recommend project one if and only if $q_1 b_1 > q_2 b_2$. Thus, since $q_1^* = 1$, the degree of pandering in the largest equilibrium (when communication can be influential) is measured by how low the acceptance probability of project two is: a lower q_2^* corresponds to more pandering.

[23]Typically, $b^{**} > b^*$. A sufficient condition that guarantees the strict inequality is that $\mathbb{E}[b_2|\alpha b_2 > b_1]$ is strictly decreasing in α at $\alpha = 1$. This is satisfied, for example, by both the leading parametric families of distributions.

[24]For the agent, this means that his expected payoff is weakly smaller for all $\mathbf{b}$ and strictly smaller for some $\mathbf{b}$.

[25]Assumption (A3) is what ensures that when $b_0 > b_0^{**}$, the largest equilibrium is the zero equilibrium. Without (A3), communication will still be non-influential when $b_0 > b_0^{**}$, but it could be that there is another threshold, $b_0^{***} > b_0^{**}$ such that $\mathbf{q}^* = (1,0)$ for $b_0 \in (b_0^{**}, b_0^{***})$, and only when $b_0 > b_0^{***}$ do we have $\mathbf{q}^* = (0,0)$. The reason is that without (A3), it could be that $\mathbb{E}[b_1] \geq b_0$ but no amount of pandering toward project one is sufficient to raise the posterior expectation of project two up to the outside option when it is recommended.

Since $b_0^* = \mathbb{E}[b_2|b_2 > b_1] \geq \mathbb{E}[b_2]$, Part 2(a) of Theorem 1 implies that a sufficient condition for existence of a truthful equilibrium is $\mathbb{E}[b_2] \geq b_0$, i.e. that the conditionally worse-looking project has higher ex-ante expectation than the outside option. Note that the truthful equilibrium would exist even if $\mathbb{E}[b_1] < b_0 < \mathbb{E}[b_2]$, which is possible under strong ordering, as discussed more later. Since $b_0^{**} \leq \mathbb{E}[b_1|b_1 > b_2]$,[26] Part 2(c) of the theorem implies that only the zero equilibrium exists if $b_0 > \mathbb{E}[b_1|b_1 > b_2]$ (hence, *a fortiori*, $b_0 \geq \mathbb{E}[\max\{b_1, b_2\}]$). Note that this condition is not necessary, however, because even if $\mathbb{E}[b_2|b_2 > b_1] < b_0 < \mathbb{E}[b_1|b_1 > b_2]$, only the zero equilibrium will exist if the degree of pandering needed to make project two acceptable to the DM is so high that project one becomes unacceptable when it is recommended. For this reason, q_2^* is typically bounded away from zero when $b_0 < b_0^{**}$, and then drops discontinuously to zero when b_0 crosses the b_0^{**} threshold. This is analogous to the discontinuity shown in Figure 1(a) for the agent's pandering in the example of Section I.[27]

Part 2(b) of Theorem 1 contains two comparative statics associated with the increase in the value of outside option (in the region where the best equilibrium has pandering). First, as one would expect, an increase in the outside option value leads to a strictly more pandering, because the agent must distort more for the DM to be willing to accept project two when recommended. Less obviously, the DM's welfare strictly decreases with a higher value of outside option. To see why, note that in a pandering equilibrium, the DM is indifferent between project two and the outside option when the agent recommends the former. This implies that holding fixed the agent's recommendation strategy, the DM's utility is the same whether she plays $\mathbf{q}^* = (1, q_2^*)$ or just rubber-stamps both projects, $\mathbf{q} = (1, 1)$. Since in the relevant region a higher b_0 induces more pandering, a DM who plays $\mathbf{q} = (1, 1)$ would be choosing the better project less often when b_0 is higher, which implies the welfare result.

When $b_0 < b_0^*$, the value of the outside option is irrelevant for the DM's welfare since the best equilibrium is truthful. Once $b_0 > b_0^{**}$, the DM's welfare is strictly increasing in b_0 since the outside option is always chosen. Altogether then, the outside option has a *non-monotonic* effect on the DM's expected payoff, just as was seen in Figure 1(b) for the example in Section I. Naturally, the agent's welfare is weakly decreasing in b_0: it is constant and identical to the DM's when $b_0 \leq b_0^*$, then strictly declines in b_0 in the pandering interval (b_0^*, b_0^{**}), and finally drops to zero once $b_0 > b_0^{**}$.

The characterization of Theorem 1 provides another interesting insight: when pandering arises, the agent does not benefit from a commitment to truthfully

[26] To confirm this, note that if $b_0 > \mathbb{E}[b_1|b_1 > b_2]$, then strong ordering implies that for any $\mathbf{q} > \mathbf{0}$, $\mathbb{E}[b_1|q_1 b_1 > q_2 b_2] < b_0$ because $q_1 \geq q_2$ by part 1 of Theorem 1. Hence, there cannot be a non-zero equilibrium.

[27] Note that because the example had binary project values, the DM's acceptance probability of project two was constant (at 1/4) in the pandering region, even as the agent's pandering increased with the outside option. As already discussed, there is now instead a one-to-one correspondence between the agent's pandering and the DM's acceptance probability of project two.

recommend the best alternative. To see this, observe that if the agent were constrained to rank the projects truthfully, the DM would play $\mathbf{q} = (1, 0)$ when $b_0 \in (b_0^*, b_0^{**})$. The agent interim — hence, ex-ante — prefers the pandering equilibrium vector $(1, q_2^*)$, since he can still get project one whenever he wants but also chooses to recommend project two if $b_2 q_2^* > b_1$. In this sense, cheap-talk about rankings is not self-defeating in the current model: for intermediate conflicts of interest (captured by b_0), the agent prefers the equilibrium pandering to tying his hands *ex ante* to a truthful ranking.[28] Indeed, for any $b_0 \in (b_0^*, b_0^{**})$, if the DM were to think naively that the agent is always recommending the better project (e.g., because she is not aware of the conflict of interest), the agent would want to change the DM's beliefs and behavior by convincing the DM that he is in fact pandering (e.g. by making her aware of the conflict of interest).

A related insight is that the *alternatives* themselves (e.g., recruiting candidates) can also benefit from pandering. This is again because when $b_0 \in (b_0^*, b_0^{**})$, project two would never be implemented if the agent ranks projects truthfully while it is implemented with positive probability in the pandering equilibrium. The logic can be seen via a faculty hiring application: without pandering, a candidate from a lesser-ranked school would be recommended whenever a committee finds him to be the best, but such a recommendation may never be accepted by the Dean, whose cost of resources is not internalized by the committee. On the other hand, with pandering, the candidate is only recommended when he sufficiently dominates a candidate from a better-ranked school; this happens less often, but the candidate benefits because he is at least approved sometimes when recommended. Moreover, a candidate from a better-ranked school also benefits from pandering because he is recommended more often (even when moderately worse that the other candidate) and is approved when recommended.

Theorem 1 can be substantiated with explicit formulae for our two leading parametric families of distributions. Online Appendix C provides details, which we summarize as follows:

EXAMPLE 1 (Scale-invariant uniform distributions): *Assume that b_2 is uniformly distributed on $[0, 1]$, while b_1 is uniformly distributed on $[v, 1+v]$ with $v \in (0, 1)$.*[29] *Strong ordering is satisfied, so Theorem 1 applies. It can be computed that $b_0^* = \frac{2+v}{3}$, $q_2^* = \frac{v}{3b_0-2}$, and b_0^{**} is the (unique) solution to $b_0^{**} = \mathbb{E}[b_1 | b_1 > (\frac{v}{3b_0^{**}-2}) b_2]$, which is indeed larger than b_0^*. The degree of pandering increases with b_0, i.e. q_2^* is decreasing in b_0. Moreover, b_0^* and q_2^* are increasing in v; in this sense, project two becomes more acceptable when project one is stronger.*

[28]It is generally ambiguous whether the agent would prefer to tie his hands to a full disclosure of the vector $\mathbf{b}$ when the best equilibrium has pandering. For instance, in the example of Section I, one can compute that the agent's ex-ante utility would indeed be higher under full disclosure than the pandering equilibrium; on the other hand if the example were changed so that the low value of b_1 is 3 instead of 1, then the conclusion is reversed. While we do not pursue a systematic analysis of optimal information disclosure by the agent when he can commit, see Kamenica and Gentzkow (2011) and Rayo and Segal (2010) for work in this direction.

[29]Assumptions (A1) and (A3) require that $b_0 < 1$.

EXAMPLE 2 (Exponential distributions): *Assume that b_1 and b_2 are exponentially distributed with means v_1 and v_2, where $v_1 > v_2 > 0$.*[30] *Strong ordering is satisfied, so Theorem 1 applies. It can be computed that $b_0^* = v_2 + \frac{v_1 v_2}{v_1+v_2}$, $q_2^* = \frac{v_1}{v_2}\left(\frac{2v_2-b_0}{b_0-v_2}\right)$, and $b_0^{**} = \frac{3v_1v_2}{v_1+v_2} > b_0^*$. An increase in b_0 leads to more pandering (i.e., q_2^* falls in b_0). Again, b_0^* and q_2^* are increasing in v; in this sense, project two becomes more acceptable when project one is stronger. Online Appendix C also provides a closed-form formula for the DM's ex-ante expected payoff which may be useful for applications.*

What drives the direction of pandering? Casual intuition may suggest that the agent will pander toward a project that is ex-ante attractive. Indeed, within the scale-invariant uniform or the exponential family of distributions, our strong ordering condition is equivalent to $v_1 > v_2$, and hence agrees with all usual stochastic ordering notions, including likelihood-ratio ordering (and hence with ex-ante expected values).[31]

In general, however, Theorem 1 and condition (R1) reveal that the direction of pandering can be subtle, as it may diverge from what would be suggested by usual stochastic relations. The reason is intimately related to how strategic persuasion works in the current setting. When the agent recommends a project to the DM, he is making a *comparative statement* about alternative projects by conveying that the project he recommends is better than the other. Thus, what is key for the direction of pandering is the *conditional expectation of a project when it is ranked the best.* Recall that (R1) says that project one is conditionally better-looking in the sense of having a higher conditional expectation when the agent ranks projects truthfully. Crucially, a project that looks best "in isolation" need not be the one that is conditionally better-looking, because the posterior about the recommended project can depend substantially on the project it is compared against. For this reason, the conditionally better-looking project can be dominated by project two in ex-ante expectation and even in likelihood ratio. The discrete example of Section I illustrated this point with respect to ex-ante expectation. More generally, in the current setting of continuous distributions, given any distribution F_2 with $\underline{b}_2 > 0$, there is a family of F_1 distributions that are likelihood-ratio dominated by F_2 but satisfy (R1).[32]

[30] Assumption (A3) requires that $b_0 < 2v_2$.

[31] Given a distribution F with support $[\underline{b}, \overline{b}] \subseteq \mathbb{R}_+$ and a distribution F' with support $[\underline{b}', \overline{b}'] \subseteq \mathbb{R}_+$, F likelihood-ratio dominates F' if $\overline{b} \geq \overline{b}'$, $\underline{b} \geq \underline{b}'$, and their respective densities f and f' satisfy $\frac{f(\tilde{b})}{f(b)} \geq \frac{f'(\tilde{b})}{f'(b)}$ for any $\overline{b}' > \tilde{b} > b > \underline{b}'$. The likelihood-ratio domination is strict if either the ratio inequality holds strictly for a set of positive measure in the relevant region or $[\underline{b}, \overline{b}] \neq [\underline{b}', \overline{b}']$.

[32] A revealing construction is as follows: set $\overline{b}_1 = \overline{b}_2$ and choose any $\underline{b}_1 \in [0, \underline{b}_2)$ and $x \in (0, 1)$. Then define F_1 by any density f_1 such that $f_1(b) = x f_2(b)$ for $b \geq \underline{b}_2$; the mass $1-x$ can distributed arbitrarily over $[\underline{b}_1, \underline{b}_2)$. With this construction, F_2 clearly likelihood-ratio dominates F_1, and it can be verified that (R1) holds (see Theorem 11 in online Appendix G). The intuition for the latter point is that since the distributions of both projects are identical conditional on having a value larger than $\underline{b}_2$, yet project one has a positive probability of being realized below $\underline{b}_2$, the news that $b_1 > b_2$ is more favorable to project one than the news that $b_2 > b_1$ is to project two.

It is also useful to note that when the agent panders toward project one, he does not necessarily recommend project one *more often* (i.e. with higher ex-ante probability) than project two; generally, this depends on the projects' value distributions and the degree of equilibrium pandering. In particular, if project one is suitably weaker than project two when viewed in isolation — e.g. it is first-order stochastically dominated — and pandering is not too severe, then project one will be recommended overall less often, and also selected less often, than project two.[33] This underscores that the pandering distortion is relative to truthful recommendations and occurs when the realization of b_1 is lower than but sufficiently close to b_2.

The next result further develops the economics of comparative rankings.

THEOREM 2: *Fix b_0 and an environment $\mathbf{F} = (F_1, F_2)$ that satisfies strong ordering. Let $\tilde{\mathbf{F}} = (\tilde{F}_1, \tilde{F}_2)$ be an environment with a weaker slate of alternatives: $\tilde{F}_j = F_j$ for some j, and for $i \neq j$, either (a) F_i strict likelihood-ratio dominates $\tilde{F}_i$ and $\tilde{\mathbf{F}}$ satisfies strong ordering, or (b) $\tilde{F}_i$ is a degenerate distribution at zero. Letting $\mathbf{q}^*$ and $\tilde{\mathbf{q}}^*$ denote the best equilibria in each of the respective environments, we have $\mathbf{q}^* \geq \tilde{\mathbf{q}}^*$. Moreover, $\mathbf{q}^* > \tilde{\mathbf{q}}^*$ if $\mathbf{q}^* > \mathbf{0}$ and $\tilde{\mathbf{q}} < \mathbf{1}$.*

Theorem 2 considers two senses in which the slate of alternatives becomes stronger when switching from environment $\tilde{\mathbf{F}}$ to $\mathbf{F}$: in case (a), the number of projects is held constant, but the distribution of one project improves in the sense of strict likelihood-ratio dominance; in case (b), the environment $\tilde{\mathbf{F}}$ consists of only one project while the environment $\mathbf{F}$ is obtained by adding a new project to $\tilde{\mathbf{F}}$. In either case, the best equilibrium in the stronger environment is at least as large as the original environment, and strictly larger if the original environment did not have a truthful equilibrium and the stronger environment has a non-zero equilibrium. (These caveats are necessary, or else both environments would have the same best equilibrium, either truthful or zero respectively.)

An important implication of Theorem 2 is that the best equilibrium in the stronger environment can be strictly larger if the value distribution that improves is that of project one, *even though project one is already accepted with probability one when recommended*. In this sense, project two can become more acceptable to the DM when project one becomes stronger, even though project two's distribution is unchanged. This is entirely due to the property of comparative rankings: an improvement in F_1 improves the conditional expectation of project two when

[33] To see this, assume project one is first-order stochastically dominated by project two and that the two distributions are not the same. Then $\Pr(\{\mathbf{b} : b_2 > b_1\}) = \int_0^\infty F_1(b) f_2(b) db > \int_0^\infty F_2(b) f_2(b) db \geq \int_0^\infty F_2(b) f_1(b) db = \Pr(\{\mathbf{b} : b_1 > b_2\})$, where the second inequality uses the well-known relationship between first-order stochastic dominance and expectations of increasing functions. By continuity, $\Pr(\{\mathbf{b} : q_2 b_2 > b_1\}) > \Pr(\{\mathbf{b} : b_1 > q_2 b_2\})$ for all q_2 sufficiently close to 1, which implies that project two is recommended (and ends up being selected) more often than project one so long as the degree of pandering is not too large. If, on the other hand, project one first-order stochastically dominates project two, then the same logic implies that the project one will be recommended more often than project two under truthful reporting. Plainly, pandering will then cause project one to be recommended (and selected) even more often.

it is recommended, holding fixed the equilibrium acceptance vector. Strong ordering then implies the existence of a larger equilibrium if the original equilibrium was not truthful. Examples 1 and 2 illustrate this point: there, a likelihood-ratio improvement of project one corresponds to an increase in v and v_1 respectively in the two examples, and as noted there, this causes b_0^* and q_2^* to both increase.

Case (b) of Theorem 2 implies that the agent never benefits from "hiding a project." To fix ideas, suppose the availability of project one is common knowledge between the DM and the agent, but the availability of project two is not. Project two is only available with some probability, and its availability is privately known to the agent. The theorem implies that if the agent can credibly prove the availability of project two, it is always optimal for the agent to do so. It is also possible, for instance, that for each i, $\mathbb{E}[b_i] < b_0$ but $\mathbb{E}[b_i|b_i > b_{-i}] > b_0$; in such a case, the agent can get the better project accepted when both are available but neither project accepted if only one of the projects were available.

What if the projects are not strongly ordered? While strong ordering is essential for delivering the full force — in particular, the comparative statics — of Theorem 1 and Theorem 2, a weaker stochastic ordering suffices to identify a systematic direction of pandering.

DEFINITION 2: *The two projects are **weakly ordered** if for all $\alpha \geq 1$, $\mathbb{E}[b_1|b_1 > \alpha b_2] > \mathbb{E}[b_2|\alpha b_2 > b_1]$.*

It is straightforward that strong ordering implies weak ordering. The latter is weaker because it does not require (R2). Rather, weak ordering allows $\mathbb{E}[b_i|b_i > \alpha b_{-i}]$ to decrease in α, but requires that the ranking assumed in (R1), i.e. that $\mathbb{E}[b_1|b_1 > \alpha b_2] > \mathbb{E}[b_2|\alpha b_2 > b_1]$ when $\alpha = 1$, must be preserved for all larger α.[34]

THEOREM 3: *Assume the two projects are weakly ordered. Then, any influential but non-truthful equilibrium has pandering toward project one.*

PROOF:

Under weak ordering, there cannot be an equilibrium with $1 > q_2 = q_1 > 0$ because then the agent will be truthful, hence $b_0 = \mathbb{E}[b_1|b_1 > b_2] > \mathbb{E}[b_2|b_2 > b_1] = b_0$, a contradiction. So any non-truthful but influential equilibrium must have either $q_1 > q_2 > 0$ or $q_2 > q_1 > 0$. But the latter configuration cannot be an equilibrium because for $\alpha = \frac{q_2}{q_1} > 1$, $\mathbb{E}[b_1|b_1 > \alpha b_2] > \mathbb{E}[b_2|b_1 < \alpha b_2] \geq b_0$, hence the DM's optimality requires $q_1 = 1$, a contradiction.

This result is tight in the sense that the weak ordering condition is *not only sufficient but also almost necessary* for pandering to systematically go in the direction of one project. In other words, if projects cannot be weakly ordered (even after relabeling projects), then generally the agent may pander toward either project depending on the outside option. To see this, suppose $\mathbb{E}[b_1|b_1 > b_2] > \mathbb{E}[b_2|b_2 > b_1]$

[34]For example, truncated Normal distributions typically satisfy weak ordering but fail (R2).

but for some $\alpha' > 1$, $\mathbb{E}[b_1|b_1 > \alpha' b_2] < \mathbb{E}[b_2|\alpha' b_2 > b_1]$. Then for some $b_0 \in (\mathbb{E}[b_2|b_2 > b_1], \mathbb{E}[b_2|b_2 > b_1] + \varepsilon)$ for a small $\varepsilon > 0$, there exists a pandering equilibrium $\mathbf{q} = (1, q_2)$ with $q_2 \in (0,1)$, i.e. the agent panders toward project one. Yet, for some $b_0 \in (\mathbb{E}[b_1|b_1 > \alpha' b_2], \mathbb{E}[b_1|b_1 > \alpha' b_2] + \varepsilon)$ for a small $\varepsilon > 0$, there is an equilibrium $\mathbf{q}' = (q_1', 1)$ with $q_1' \approx 1/\alpha' \in (0,1)$, i.e. the agent now panders toward project two.

More than two projects. Much of the preceding analysis generalizes to $n > 2$, as shown formally in online Appendix D. The caveats are that for $n > 2$, (i) instead of deriving the conclusion of Lemma 1 as a result, we assume the multi-project version of it; (ii) the notion of strong ordering must be appropriately generalized and strengthened; and (iii) the largest equilibrium need not be the best equilibrium for the DM, although it remains so for the agent. Nevertheless, we argue in the online Appendix that the largest equilibrium is still compelling to focus on. Subject to these caveats, Theorem 7 in the online Appendix generalizes Theorem 1 by establishing that for $n > 2$, there are also threshold values, b_0^* and b_0^{**}, such that (i) for $b_0 < b_0^*$, there is a truthful equilibrium; (ii) for $b_0 \in (b_0^*, b_0^{**})$, the largest equilibrium has pandering towards conditionally better-looking projects; and (iii) for $b_0 > b_0^{**}$, the only equilibrium is the zero equilibrium. Furthermore, Theorem 8 in the online Appendix develops an essentially identical analogue to Theorem 2. In particular, these results apply to the scale-invariant and exponential families for $n > 2$.

IV. Pandering under Commitment

The previous section established that for moderate outside options, pandering necessarily arises in the best cheap-talk equilibrium. An important question is to what extent this is due to the DM's inability to commit to how she will use any information revealed by the agent. In this section, we study various degrees of commitment power.

A. *Simple mechanisms*

Consider first a simple class of mechanisms where the agent must choose a message $i \in \{1, 2\}$, but unlike the cheap-talk game, the DM is now able to commit ex-ante to a vector of acceptance probabilities, $\mathbf{q}$, where each $q_i \in [0, 1]$. As before, when the agent sends message i, the DM chooses project i with probability q_i and the outside option with probability $1 - q_i$. We refer to any such mechanism as a **simple mechanism**. This class of mechanisms can obviously implement any cheap-talk outcome, but also various other outcomes such as *full delegation* (implemented by setting $\mathbf{q} = \mathbf{1}$) and *delegation to intermediaries* (any $\mathbf{q}^* < \mathbf{q} < \mathbf{1}$). To see the last point, note that Part 2(b) of Theorem 1 implies that if b_0 is such that $\mathbf{0} < \mathbf{q}^* < \mathbf{1}$, then the DM can implement any $\mathbf{q}$ such that $\mathbf{q}^* < \mathbf{q} < \mathbf{1}$ by delegating decision rights to a third-party who values the outside option at an appropriate $b_0' \in (0, b_0)$ and then requiring the third party and the agent to play the cheap-talk game. The presence of such a third party is plausible in a hierarchical organization because often an intermediate boss or a supervisor internalizes the value of the outside option more than the agent but not as much as the principal.

An optimal mechanism within the class of simple mechanisms must solve the following problem:

$$\max_{\mathbf{q}\in[0,1]^2} \mathbb{E}\left[\sum_{i\in\{1,2\}} q_i(b_i - b_0)\cdot \mathbb{1}_{\{q_i b_i > q_{-i} b_{-i}\}}\right] + b_0, \tag{4}$$

where $\mathbb{1}_{\{\cdot\}}$ is an indicator function that equals one in the event of $\{\cdot\}$ and zero otherwise.

In other words, the DM chooses an acceptance vector $\mathbf{q}$ knowing that the agent will respond optimally to it in terms of which project he recommends. Note that the DM is allowed to choose a vector $\mathbf{q}$ whereby she accepts a recommended project with positive probability even though its posterior value may be strictly less than b_0; of course, this requires credible commitment.

It will be useful to introduce a random variable that is the ratio of the project values, $\theta := \frac{b_1}{b_2}$. The cumulative distributions F_1 and F_2 induce a cumulative distribution, F, over $\theta \in \Theta := [\underline{\theta}, \overline{\theta}]$, where $\underline{\theta} := \frac{\underline{b}_1}{\overline{b}_2}$ and $\overline{\theta} := \frac{\overline{b}_1}{\underline{b}_2}$ if $\overline{b}_1 < \infty$ and $\underline{b}_2 > 0$ and $\overline{\theta} := \infty$ otherwise.[35] Let f be the density of F. Denoting $\mathbf{q}^c$ as a solution to (4), we have:

THEOREM 4: *Assume the two projects are strongly ordered. Then in any optimal simple mechanism,* $\mathbf{q}^c$, $q_1^c \geq q_2^c$*. If the best cheap-talk equilibrium is* $\mathbf{q}^* = \mathbf{1}$ *then the optimal simple mechanism is* $\mathbf{q}^c = \mathbf{1}$*. If* $\mathbf{q}^* < \mathbf{1}$*, then* $\mathbf{q}^c < \mathbf{1}$*. If* $\mathbf{1} > \mathbf{q}^* > \mathbf{0}$*, then* $\mathbf{1} > \mathbf{q}^c \geq \mathbf{q}^*$*; moreover, if* $f(q_2^*) > 0$ *then* $\mathbf{q}^c > \mathbf{q}^*$*.*

The first part of the theorem says that in any optimal simple mechanism, the DM accepts project one with a weakly higher probability than project two; hence, if $\mathbf{q}^c \neq \mathbf{0}$ and the mechanism causes any distortion in the agent's recommendation, the agent will bias his recommendation toward the conditionally better-looking project. The second part of the theorem says that if cheap talk can sustain truthful rankings, then it cannot be improved on in the class of simple mechanisms. The third part says that if communication cannot be truthful, then the optimal simple mechanism does not fully delegate the project choice to the agent. The last part is the most important: it says that whenever the best cheap-talk equilibrium is influential but has pandering, *an optimal simple mechanism also induces the agent to pander, but generally less so than in the cheap-talk game.* To see why an optimal mechanism must induce some pandering in this case, assume project two is undesirable if the agent recommends the best project, i.e that

[35] Note that $\underline{\theta}$ is well-defined because $0 \leq \underline{b}_1 < \infty$ and $0 < \overline{b}_2 \leq \infty$.

$\mathbb{E}[b_2|b_2 > b_1] < b_0$. By Theorem 1, this is necessary and sufficient for a truthful equilibrium not to exist in the cheap-talk game. Starting from a commitment to $\mathbf{q} = \mathbf{1}$, suppose the DM lowers q_2 slightly below 1. The benefit is that when project two is recommended, the outside option b_0 will be sometimes realized instead of b_2. The cost is that this induces some pandering. However, the benefit is first-order because $\mathbb{E}[b_2|b_2 > b_1] < b_0$, while the cost is second-order because there is no pandering distortion at $\mathbf{q} = \mathbf{1}$. On balance, reducing q_2 slightly below 1 is beneficial.

To see why the optimal mechanism involves reduced pandering relative to communication (so long communication is influential but not truthful), observe that if the DM raises q_2 slightly when starting at $\mathbf{q}^*$ (with $\mathbf{0} < \mathbf{q}^* < \mathbf{1}$), there is a first-order benefit of reducing pandering since $q_2^* < q_1^* = 1$,[36] but only a second-order cost because $\mathbb{E}[b_2|q_2^* b_2 > b_1] = b_0$. Extending this logic shows that we must have $\mathbf{q}^c > \mathbf{q}^*$. Since $\mathbf{1} > \mathbf{q}^c > \mathbf{q}^*$, the optimal simple mechanism can be implemented by delegation to an appropriately chosen intermediary, as discussed earlier.

Although Theorem 4 establishes that full delegation (i.e. $\mathbf{q} = \mathbf{1}$) is dominated by some other simple mechanism for the relevant outside options, full delegation may be easier to commit to (e.g. through contract, transfer of ownership, eliminating the outside option, etc.). An interesting question then is whether the DM would prefer to delegate or to communicate with the agent if these are the only two choices she has. While delegation eliminates pandering because the agent will always choose the best project, it sometimes leads to a project being implemented even when the DM prefers the outside option. The tradeoff has a simple resolution:

THEOREM 5: *Assume the two projects are strongly ordered and that the best cheap-talk equilibrium is* $\mathbf{q}^* > \mathbf{0}$. *Compared to any cheap-talk equilibrium, the DM is ex-ante weakly better off by delegating authority to the agent, and strictly so if* $\mathbf{q}^* < \mathbf{1}$.

To see the intuition, suppose $\mathbf{0} < \mathbf{q}^* < 1$. By Theorem 1, the DM is then randomizing between accepting project two and rejecting it when it is recommended, so she must be indifferent between project two and the outside option. Holding the agent's strategy fixed, the DM's expected utility is the same whether she plays $\mathbf{q}^*$ or always rubber-stamps the agent's recommendation. Delegation effectively commits the DM to playing the latter strategy and also has the additional benefit of eliminating pandering since the agent will always choose the best project. Therefore, the DM is strictly better off by delegating. Indeed, delegation can be preferred to communication even if $\mathbf{q}^* = \mathbf{0}$, so long as $b_0 < \mathbb{E}[\max\{b_1, b_2\}]$.[37]

[36] To be more precise, the benefit requires that the density of project values such that $q_2^* b_2 = b_1$ be strictly positive, i.e. $f(q_2^*) > 0$. This explains the caveat in the statement of the Theorem. Note that because $q_2^* > 0$ by Theorem 1, the positive density requirement is only at an interior point.

[37] Theorem 5 is stronger than the delegation result in the Crawford and Sobel (1982) cheap talk-model. For that model, Dessein (2002) has shown that delegation is generally preferred to communication only

B. General mechanisms

Next we turn to more general mechanisms: can the DM do even better — further mitigate or even eliminate pandering — by using a mechanism that is not simple? For example, could it be optimal to commit to sometimes randomize between both projects, either by themselves or possibly also including the outside option? To answer this question, we solve a full-fledged mechanism design exercise without transfers. By the revelation principle, we can restrict attention to incentive compatible direct revelation mechanisms. It is convenient to view a direct revelation mechanism as a pair of functions $(\overline{x}, \overline{y}) : \Theta \times [\underline{b}_2, \overline{b}_2] \to A$ where $A := \{(x, y) \in [0, 1]^2 \mid x + y \leq 1\}$. Here, given the ratio $\theta = b_1/b_2$ and the value b_2, $\overline{x}(\theta, b_2)$ is the probability with which project 1 is chosen, $\overline{y}(\theta, b_2)$ is the probability with which project 2 is chosen, and $1 - \overline{x}(\theta, b_2) - \overline{y}(\theta, b_2)$ is the probability with which the outside option is chosen.

LEMMA 4: *Let $(\overline{x}, \overline{y})$ be an incentive-compatible mechanism. Then for all θ, $(\overline{x}(\theta, b_2), \overline{y}(\theta, b_2)) = (\overline{x}(\theta, b_2'), \overline{y}(\theta, b_2'))$ for any $b_2 \neq b_2'$.*

In words, the above result says that an incentive compatible direct revelation mechanism can only depend on b_1 and b_2 through the ratio b_1/b_2 and not, in addition, on the levels. Importantly, this effectively reduces the two-dimensional type space into a one-dimensional problem. Notice that the utility that type (θ, b_2') gets from a bundle $(x, y) \in A$ is just a monotone transformation of the utility that type (θ, b_2) gets from the same bundle; hence the two types have exactly the same preferences over A. However, the DM's preferences over A are generally not the same for both types of the agent, because the DM cares not only about the ratio θ but also about how b_1 and b_2 compare with the outside option, b_0. Since any agent type with ratio θ is indifferent over all bundles in the set $\{(x, y) \in A \mid \theta x + y = C, \text{ for some constant } C\}$, the two types (θ, b_2) and (θ, b_2') would be willing to choose different bundles that lie on the same such indifference curve. The DM may try to exploit this indifference and separate types (θ, b_2') and (θ, b_2) when $b_2 \neq b_2'$. However, Lemma 4 says that this is impossible in an incentive compatible mechanism.

In light of Lemma 4, we can without loss focus on direct revelation mechanisms that map from Θ into A, i.e. treat the agent's type as just θ. Since type θ's preferences over bundles $(x, y) \in A$ can be represented by $u(x, y, \theta) := x\theta + y$, the problem has a resemblance to standard mechanism design problems with transfers, even though our setting does not have transfers; rather, the probability of choosing project two, y, acts like a divisible numeraire. The analogy is imperfect, however, because y is constrained to lie in $[0, 1]$ and together with x must further satisfy

if the conflict of interest is sufficiently small, rather than whenever communication is influential. By contrast, in the current model, delegation is (weakly) preferred by the DM whenever communication can be influential. In Crawford and Sobel (1982), the analogous result only holds under certain assumptions such as the "uniform-quadratic" specification.

$x + y \leq 1$. This makes the analysis significantly more involved than in standard mechanism design. To proceed, define

$$J(\theta) := -(1-\theta)b_0 f(\theta) + \int_{\theta}^{\overline{\theta}} \left(\mathbb{E}\left[b_2 \middle| \frac{b_1}{b_2} = s \right] - b_0 \right) f(s) ds. \tag{5}$$

Intuitively, $J(\cdot)$ is a suitably-constructed "virtual valuation" function. Say that $J(\cdot)$ is **piecewise monotone** if Θ can be partitioned into a finite number of subintervals such that on each subinterval, $J(\cdot)$ is monotone (either nondecreasing or nonincreasing). This is a rather mild regularity condition that permits $J(\cdot)$ to be globally non-monotone.[38]

THEOREM 6: *Assume the two projects are strongly ordered and that $J(\cdot)$ is piecewise monotone. If the best cheap-talk equilibrium is $\mathbf{q}^* < \mathbf{1}$, then an optimal simple mechanism is optimal in the class of all mechanisms without transfers.*

Hence, under the regularity condition, the insights of Theorem 4 apply in the class of all mechanisms so long as truthful communication cannot be sustained in cheap talk; in particular, an optimal unrestricted mechanism also induces pandering, but to a lesser degree than in cheap talk. Moreover, when the best cheap-talk equilibrium has pandering, the DM cannot do any better than delegating decision-making to an appropriately-chosen intermediary who must then play the cheap-talk game with the agent.

V. Conclusion

This paper has studied strategic communication by an agent who has non-verifiable private information about the benefit of different alternatives and shares a decision maker's (DM) preferences amongst these. The source of conflict, however, is over an outside option that the DM values but the agent does not fully internalize.

This type of agency problem is salient in many settings that involve some kind of resource allocation. Examples include a seller who vies for a consumer's purchase, a supplier competing for a firm's contract, a venture capitalist raising funds from wealthy individuals or institutions, a philanthropist choosing between charities, or a firm allocating its resources between divisions. In each of these cases, the agent typically does not fully internalize the resource cost because he derives private benefits when he sells more, is allocated more resources, manages more money, or is given a larger budget.

The key issue we have focussed on is the nature of cheap-talk communication when the alternatives "look different" to the DM based on either publicly observable attributes or due to verifiable information that has endogenously been

[38] $J(\cdot)$ is piecewise monotone in both our leading parametric families of distributions, even though it is not globally monotone for any parameters in the scale-invariant uniform distribution case.

revealed by the agent himself. Our core result is that this typically forces pandering in the sense of a systematic distortion in the agent's recommendations, and hence the DM's decisions, toward alternatives that are "conditionally better-looking." Which alternative is conditionally better-looking can be subtle. We have developed comparative statics in the observable information (formally, the value distributions of the alternatives) and in the outside option.

The second part of our analysis focussed on organizational responses to such pandering. If pandering is needed for influential cheap talk, then even a DM with full commitment power would find it optimal to induce pandering from the agent, but to a lesser degree than under cheap talk. Our result about the desirability of full delegation over communication implies that the following simple decision process would improve on pure communication for the DM: request first all verifiable information from the agent (or wait for the publicly observable information to be realized) and then decide between either (i) fully delegating the decision to the agent (with a commitment to not override his choice), and (ii) just going with the outside option. In this organization structure, hard information on the options is all that matters because it determines whether delegation to the agent is warranted or not; cheap talk or soft communication is of no value. This provides a rationale for "no-strings attached" budget allocations, delegation of hiring decisions to subgroups, commitments to buy in buyer-seller relationships, and requirements from venture capitalists or investment funds that investors commit their money for some period of time.

There are many other implications that can be deduced from our analysis. For example, the DM may find it beneficial to reduce or altogether eliminate her outside option, i.e. set $b_0 = 0$, as this effectively commits her to delegating the project choice to the agent. The DM may be willing to do so even if she must pay to reduce the value of outside option, implying that "burning ships" may be optimal. Alternatively, in some applications it is reasonable to think that the DM is faced with a default of $b_0 = 0$ and can only improve it at some cost. Suppose that prior to communication, the DM can endogenously choose the value b_0 of outside option at a cost $c(b_0)$, where $c(\cdot)$ is strictly increasing. Suppose further that the DM's choice of b_0 is publicly observed prior to the communication game. Then, an application of Theorem 5 shows that the DM should either not invest in the outside option at all (in which case project choice is effectively delegated to the agent) or she makes it so high that it will always be chosen (in which case the agent is irrelevant).

Another set of implications concern the DM's partial knowledge of projects' attributes, which is what causes the pandering distortion. Would the DM be better off by not having any (public) information about the projects? This depends on what partial information the DM can observe, because in addition to learning about how the projects compare against each other, the DM may also learn something about how each of them compares with the outside option. Roughly speaking, information that only informs the DM about how the projects compare with one another but not how either compares with the outside option is harmful information that can only create pandering without any countervailing benefit. The DM would prefer to remain ignorant about such information (unless she can commit to ignoring it).[39] Interested readers are referred to online Appendix E for a formal development.

The framework we have developed is amenable to a number of extensions that are relevant for applications. We conclude by mentioning a few, again providing details in online Appendix E.

An important issue is to allow the DM and the agent to have non-congruent preferences even between the alternatives to the outside option. For instance, a seller may obtain a larger profit margin on certain products, or the head of an organization may have a gender bias or prefer candidates who fit other criteria that the agent does not agree with. A simple way to introduce such conflicts is to assume that the agent derives a benefit $a_i b_i$ from project i, where $a_i > 0$ is common knowledge, while the DM continues to obtain b_i from project i.[40] The insights of our basic model carry over to this setting but with some added nuances. For example, simple full delegation becomes less attractive.

Other extensions are particularly relevant for resource allocation problems where a DM decides which projects to provide funding for. These include the DM being privately informed about the opportunity cost of resources; she not only deciding which project to fund, but also how much funding to make available for the project; and/or her being able to fund more than one project if she wishes to. Online Appendix E shows that our model readily accommodates each of these extensions and that our main themes are robust.

There are a number of more substantial issues that we hope will be studied in future work. Of particular interest is that several agents may compete for resources, in which case each competitor acts like an endogenous outside option for the DM as far as any single agent is concerned. The logic of our analysis suggests that such competition between agents can exacerbate pandering by each agent, and the DM may even be better off by limiting competition.

REFERENCES

Aghion, Philippe and Jean Tirole, "Formal and Real Authority in Organizations," *Journal of Political Economy*, February 1997, *105* (1), 1–29.

Alonso, Ricardo and Niko Matouschek, "Optimal Delegation," *Review of Economic Studies*, 2008, *75* (1), 259–293.

Ambrus, Attila and Satoru Takahashi, "Multi-sender Cheap Talk with Restricted State Spaces," *Theoretical Economics*, March 2008, *3* (1), 1–27.

[39] Of course, the finding that information can be harmful when there is a lack of commitment arises in many other contexts; in the context of strategic communication, Chen (2009) and Lai (2010) also note such possibilities in other models.

[40] This multiplicative form of bias is especially convenient to study, but it is also straightforward to incorporate an additive or other forms of bias.

Armstrong, Mark and John Vickers, "A Model of Delegated Project Choice," *Econometrica*, 01 2010, *78* (1), 213–244.

Battaglini, Marco, "Multiple Referrals and Multidimensional Cheap Talk," *Econometrica*, July 2002, *70* (4), 1379–1401.

Blanes i Vidal, Jordi and Marc Moller, "When Should Leaders Share Information with their Subordinates?," *Journal of Economics and Management Strategy*, 2007, *16*, 251–283.

Brandenburger, Adam and Ben Polak, "When Managers Cover Their Posteriors: Making the Decisions the Market Wants to See," *RAND Journal of Economics*, Autumn 1996, *27* (3), 523–541.

Canes-Wrone, Brandice, Michael Herron, and Kenneth W. Shotts, "Leadership and Pandering: A Theory of Executive Policymaking," *American Journal of Political Science*, July 2001, *45* (3), 532–550.

Chakraborty, Archishman and Rick Harbaugh, "Comparative Cheap Talk," *Journal of Economic Theory*, 2007, *132* (1), 70–94.

_ **and** _ , "Persuasion by Cheap Talk," *American Economic Review*, December 2010, *100* (5), 2361–82.

Chen, Ying, "Communication with Two-sided Asymmetric Information," 2009. mimeo, Arizona State University.

Crawford, Vincent and Joel Sobel, "Strategic Information Transmission," *Econometrica*, August 1982, *50* (6), 1431–1451.

Dessein, Wouter, "Authority and Communication in Organizations," *Review of Economic Studies*, October 2002, *69* (4), 811–838.

Goltsman, Maria, Johannes Hörner, Gregory Pavlov, and Francesco Squintani, "Mediation, Arbitration and Negotiation," *Journal of Economic Theory*, July 2009, *144* (4), 1397–1420.

Heidhues, Paul and Johan Lagerlof, "Hiding Information in Electoral Competition," *Games and Economic Behavior*, January 2003, *42* (1), 48–74.

Holmstrom, Bengt, "On the Theory of Delegation," in M. Boyer and R. Khilstrom, eds., *Bayesian Models in Economic Theory*, Amsterdam: Elsevier, 1984, pp. 115–141.

Kamenica, Emir and Matthew Gentzkow, "Bayesian Persuasion," *American Economic Review*, October 2011, *101* (6), 2590–2615.

Koessler, Frédéric and David Martimort, "Optimal Delegation with Multi-Dimensional Decisions," 2009. unpublished.

Kovác, Eugen and Tymofiy Mylovanov, "Stochastic Mechanisms in Settings Without Monetary Transfers: The Regular Case," *Journal of Economic Theory*, July 2009, *144* (4), 1373–1395.

Lai, Ernest, "Expert Advice for Amateurs," 2010. mimeo, Lehigh University.

Levy, Gilat and Ronny Razin, "On the Limits of Communication in Multidimensional Cheap Talk: A Comment," *Econometrica*, 05 2007, *75* (3), 885–893.

Loertscher, Simon, "Information Transmission by Imperfectly Informed Parties," 2010. mimeo, University of Melbourne.

Majumdar, Sumon and Sharun W. Mukand, "Policy Gambles," *American Economic Review*, September 2004, *94* (4), 1207–1222.

Maskin, Eric and Jean Tirole, "The Politician and the Judge: Accountability in Government," *American Economic Review*, September 2004, *94* (4), 1034–1054.

Milgrom, Paul R., "Good News and Bad News: Representation Theorems and Applications," *Bell Journal of Economics*, Autumn 1981, *12* (2), 380–391.

Morris, Stephen, "Political Correctness," *Journal of Political Economy*, April 2001, *109* (2), 231–265.

Nocke, Volker and Michael D. Whinston, "Merger Policy with Merger Choice," 2011. mimeo, University of Mannheim and Northwestern University.

Ottaviani, Marco and Peter Norman Sorensen, "Reputational Cheap Talk," *RAND Journal of Economics*, Spring 2006, *37* (1), 155–175.

Prat, Andrea, "The Wrong Kind of Transparency," *American Economic Review*, 2005, *95* (3), 862–877.

Prendergast, Canice, "A Theory of "Yes Men"," *American Economic Review*, September 1993, *83* (4), 757–70.

Rayo, Luis and Ilya R. Segal, "Optimal information disclosure," *Journal of Political Economy*, 2010, *118* (5), 949–987.

Seidmann, Daniel J. and Eyal Winter, "Strategic Information Transmission with Verifiable Messages," *Econometrica*, January 1997, *65* (1), 163–170.

Appendix A: Proofs

PROOFS OF LEMMAS 1 AND 2:

See online Appendix B.

PROOF OF LEMMA 3:

Fix any $i \in \{1,2\}$. For any $y \in (0, \overline{b}_i/\underline{b}_{-i})$, we can write

$$\Upsilon_i\,(y) := \mathbb{E}[b_i | b_i > y b_{-i}] = \int_0^\infty b_i f_i(b_i | b_i > y b_{-i}) db_i = \int_0^\infty b \hat{f}_i(b; y) db,$$

where

$$\hat{f}_i(b; y) := \begin{cases} \frac{F_{-i}(\frac{b}{y}) f_i(b)}{\int_0^\infty F_{-i}(\frac{\tilde{b}}{y}) f_i(\tilde{b}) d\tilde{b}} & \text{if } b \in [\max\{\underline{b}_i, y\underline{b}_{-i}\}, \overline{b}_i] \\ 0 & \text{otherwise.} \end{cases}$$

Condition (R2) states that $\Upsilon_i(y') \geq \Upsilon_i(y)$ for all $\overline{b}_i/\underline{b}_{-i} > y' > y > 0$. It therefore suffices to show that for any $\overline{b}_i/\underline{b}_{-i} > y' > y > 0$, $\hat{f}_i(\cdot; y')$ dominates $\hat{f}_i(\cdot; y)$ in likelihood ratio. Since, for any $\tilde{y} \in (0, \overline{b}_i/\underline{b}_{-i})$, $\hat{f}_i(\cdot; \tilde{y})$ has support $[\max\{\underline{b}_i, \tilde{y}\underline{b}_{-i}\}, \overline{b}_i]$, it is sufficient if

$$\frac{\hat{f}_i(b'; y')}{\hat{f}_i(b; y')} \geq \frac{\hat{f}_i(b'; y)}{\hat{f}_i(b; y)} \quad \forall b < b', 0 < y < y' \text{ such that } \max\{\underline{b}_i, y'\underline{b}_{-i}\} < b < b' < \overline{b}_i.$$

Letting $G(y, b, b') := F_{-i}(\frac{b'}{y})/F_{-i}(\frac{b}{y})$ and noting that $G(y, b, b') = 1$ if $b'/y > b/y \geq \overline{b}_{-i}$, it follows from the definition of $\hat{f}_i(\cdot; \cdot)$ that the above sufficient condition is equivalent to

$$G(y', b, b') \geq G(y, b, b') \quad \forall b < b', 0 < y < y' \text{ such that } \max\{\underline{b}_i, y'\underline{b}_{-i}\} < b < b' < \min\{\overline{b}_{-i}, \overline{b}_i\},$$

which in turn can be expressed as

(A1)
$$\frac{\partial G(y, b, b')}{\partial y} \geq 0 \quad \forall b < b' \text{ and } y > 0 \text{ such that } \max\{\underline{b}_i, y\underline{b}_{-i}\} < b < b' < \min\{\overline{b}_{-i}, \overline{b}_i\}.$$

Within the relevant domain, differentiation yields

$$\frac{\partial G(y, b, b')}{\partial y} \quad \propto \quad (b/y) F_{-i}(b'/y) f_{-i}(b/y) - (b'/y) F_{-i}(b/y) f_{-i}(b'/y).$$

It follows that (A1) holds if for any $\overline{b}_{-i} \geq b' > b \geq \underline{b}_{-i}$, $b\frac{f_{-i}(b)}{F_{-i}(b)} \geq b' \frac{f_{-i}(b')}{F_{-i}(b')}$.

PROOF OF THEOREM 1:

For any $y > 0$, let $\Lambda(y) := \mathbb{E}[b_1 | b_1 > y b_2] - \mathbb{E}[b_2 | y b_2 > b_1]$, whenever this is well-defined. Strong ordering implies that $\Lambda(y) > 0$ for any $y \geq 1$ at which it is well-defined.

STEP 1: To prove Part 1 of the theorem, pick any equilibrium $\mathbf{q}$ with $q_1 > 0$. Assume, to contradiction, that $q_2 > q_1$. Then $\mathbb{E}\left[b_1|q_1 b_1 \geq q_2 b_2\right] = \mathbb{E}\left[b_1|b_1 \geq \frac{q_2}{q_1} b_2\right] > \mathbb{E}\left[b_2|\frac{q_2}{q_1} b_2 \geq b_1\right] = \mathbb{E}\left[b_2|q_2 b_2 \geq q_1 b_1\right] \geq b_0$, where the strict inequality is by strong ordering and that $q_2/q_1 \geq 1$, while the weak inequality is because $q_2 > 0$. But equilibrium now requires that $q_1 = 1$ (recall condition (3)), a contradiction with $q_2 > q_1$. Similarly, if $0 < q_1 = q_2 < 1$, the same argument applies, except that the contradiction is not with $q_2 > q_1$ but rather with $q_1 < 1$.

Part 2 of the theorem is proved in a number of steps. Steps 2–4 below concern the essential properties of the largest equilibrium, $\mathbf{q}^*$, and the outside option thresholds, b_0^* and b_0^{**}.

STEP 2: Plainly, there is a truthful equilibrium $\mathbf{q}^* = (1,1)$ when $b_0 < b_0^* := \mathbb{E}[b_2|b_2 > b_1]$, and this is the largest equilibrium for such b_0. Note that for any $b_0 > b_0^*$, there is no equilibrium $\mathbf{q}$ with $q_1 = 0 < q_2$, because in that case the agent always recommends project two, but then $\mathbb{E}[b_2] \leq \mathbb{E}[b_2|b_2 > b_1] = b_0^* < b_0$, contradicting equilibrium condition (2). By the first part of the theorem, we conclude that for $b_0 > b_0^*$, any non-zero equilibrium $\mathbf{q}$ has $q_1 > q_2$.

STEP 3: Suppose that for all $y > 0$, $\Lambda(y) > 0$. Set $b_0^{**} := \sup_{y \in (0,1]} \mathbb{E}\left[b_2|b_1 < y b_2\right]$. Since $b_0^* = \mathbb{E}[b_2|b_2 > b_1]$, it follows that $b_0^{**} \geq b_0^*$, with equality if and only if $\mathbb{E}\left[b_2|b_1 < y b_2\right] = \mathbb{E}\left[b_2|b_1 < b_2\right]$ for all $y \in (0,1)$. Since $\mathbb{E}\left[b_2|b_1 < y b_2\right]$ is continuous in y for all $y > 0$, it follows that for any $b_0 \in (b_0^*, b_0^{**})$, there is some $q_2^* \in (0,1)$ that solves $b_0 = \mathbb{E}\left[b_2|b_1 < q_2^* b_2\right]$; if there are multiple solutions, pick the largest one. Suppose the agent recommends project two if and only if $q_2^* b_2 > b_1$. Since $\mathbb{E}[b_1|b_1 \leq q_2^* b_2] < \mathbb{E}\left[b_2|b_1 < q_2^* b_2\right] = b_0$, it is optimal for the DM to accept project two with probability q_2^* when it is recommended. Moreover, $\mathbb{E}[b_2|b_1 > q_2^* b_2] \leq \mathbb{E}[b_2] \leq \mathbb{E}[b_2|q_2^* b_2 > b_1] = b_0 < \mathbb{E}[b_1|b_1 > q_2^* b_2]$, where the last inequality is by the hypothesis that $\Lambda(y) > 0$ for all $y > 0$; hence it is also optimal for the DM to accept project one when recommended. Therefore, $\mathbf{q}^* = (1, q_2^*)$ is a pandering equilibrium, which by construction is larger than any other equilibrium $\mathbf{q}$ with $q_1 = 1$. Moreover, any non-zero equilibrium $\tilde{\mathbf{q}}$ with $\tilde{q}_1 < 1$ has $\tilde{q}_1 > \tilde{q}_2$ (see Step 2), hence there would be a larger equilibrium $\mathbf{q} = (1, \tilde{q}_2/\tilde{q}_1)$, which in turn is weakly smaller than $\mathbf{q}^*$. Finally, we don't need to consider $b_0 \geq b_0^{**}$ because this violates Assumption (A3).

STEP 4: Suppose now that $\Lambda(y) = 0$ for some $y > 0$. Let $\hat{y} := \max\{y : \Lambda(y) = 0\}$. Since $\Lambda(1) > 0$, it follows that $\hat{y} < 1$ and $\Lambda(y) > 0$ for all $y > \hat{y}$. Set $b_0^{**} = \mathbb{E}\left[b_2|b_1 < \hat{y} b_2\right]$. Plainly, $b_0^{**} \geq b_0^*$, with strict inequality if $\mathbb{E}[b_2|b_1 < y b_2]$ is strictly decreasing at $y = 1$. It follows from the continuity of $\mathbb{E}\left[b_2|b_1 \leq y b_2\right]$ in y for $y \in [\hat{y}, 1]$ that for all $b_0 \in (b_0^*, b_0^{**}]$, there is a solution $q_2^* \in (\hat{y}, 1)$ to $b_0 = \mathbb{E}\left[b_2|b_1 < q_2^* b_2\right] < \mathbb{E}\left[b_1|b_1 > q_2^* b_2\right]$; if there are multiple solutions, pick the largest one. By arguments similar to those used in Step 1, $q^* = (1, q_2^*)$ is a pandering equilibrium that is also the largest among all equilibria. Finally, we must argue that for $b_0 > b_0^{**}$, the only equilibrium is $\mathbf{q}^* = \mathbf{0}$. Note there is no influential equilibrium by the construction of b_0^{**}, and by Step 2, any non-influential equilibrium $\mathbf{q}$ must have $q_2 = 0$. But $\mathbb{E}[b_1] \leq \mathbb{E}[b_1 | b_1 > \hat{y} b_2] = \mathbb{E}[b_2 | b_1 < \hat{y} b_2] = b_0^{**} < b_0$, so there is no equilibrium $\mathbf{q}$ with $q_1 > 0 = q_2$.

STEP 5: This step shows that $\mathbf{q}^*$ is the best equilibrium. Since $\mathbf{q}^* = \mathbf{0}$ is the only equilibrium when $b_0 > b_0^{**}$, assume $b_0 < b_0^{**}$. Clearly, the agent prefers a larger equilibrium (in the sense that his expected payoff is weakly larger for all $\mathbf{b}$ and strictly larger for some $\mathbf{b}$), so we need only show that the DM's welfare is highest at $\mathbf{q}^*$. As shown earlier, $b_0 < b_0^{**}$ implies that the largest equilibrium $\mathbf{q}^*$ has $q_1^* = 1$. Suppose there exists another equilibrium $\mathbf{q} < \mathbf{q}^*$.

Consider first $q_1 = 0$ and $q_2 = 0$. The DM weakly prefers $\mathbf{q}^*$ since she always chooses a project that gives her on expectation at least b_0. Consider next $q_1 = 0$ and $q_2 > 0$. Then $\mathbb{E}[b_2] \geq b_0$, which implies by strong ordering that $\mathbb{E}[b_1 | b_1 \geq b_2] > \mathbb{E}[b_2 | b_2 \geq b_1] \geq \mathbb{E}[b_2]$, hence $\mathbf{q}^* = \mathbf{1}$. Clearly, the DM strictly prefers $\mathbf{q}^*$ over $\mathbf{q}$. Finally, suppose $q_1 > 0$. Then, by the first part of the theorem, $q_1 \geq q_2$. We can assume $q_1 = 1$, for otherwise there exists another equilibrium $\mathbf{q}' = \frac{1}{q_1}\mathbf{q}$ which the DM prefers at least weakly to $\mathbf{q}$. Since $\mathbf{q} < \mathbf{q}^*$, it now follows that $q_2 < q_2^*$. Let $\Pi(\tilde{\mathbf{q}})$ denote the DM's expected payoff in an arbitrary equilibrium $\tilde{\mathbf{q}}$. Notice that in computing $\Pi(\mathbf{q}^*)$ or $\Pi(\mathbf{q})$, we can keep the agent's strategy fixed and assume the DM instead adopts both projects with probability one when recommended (even though she may not in equilibrium), because of the DM's indifference when she adopts project two with strictly interior probability. Thus,

$$\begin{aligned}
\Pi(\mathbf{q}^*) &= \mathbb{E}\left[b_1 \cdot \mathbb{1}_{\{b_1 > q_2^* b_2\}} + b_2 \cdot \mathbb{1}_{\{q_2 b_2 < b_1 < q_2^* b_2\}} + b_2 \cdot \mathbb{1}_{\{b_1 < q_2 b_2\}}\right] \\
&> \mathbb{E}\left[b_1 \cdot \mathbb{1}_{\{b_1 > q_2^* b_2\}} + b_1 \cdot \mathbb{1}_{\{q_2 b_2 < b_1 < q_2^* b_2\}} + b_2 \cdot \mathbb{1}_{\{b_1 < q_2 b_2\}}\right] \\
&= \mathbb{E}\left[b_1 \cdot \mathbb{1}_{\{b_1 > q_2 b_2\}} + b_2 \cdot \mathbb{1}_{\{b_1 < q_2 b_2\}}\right] = \Pi(\mathbf{q}),
\end{aligned}$$

where the strict inequality holds because $\Pr\{\mathbf{b} : q_2 b_2 < b_1 < q_2^* b_2\} > 0$ and in this event, $b_2 > b_1$ because $q_2^* \leq 1$.

STEP 6: Finally, we address the comparative statics when b_0 increases within the region (b_0^*, b_0^{**}). It is clear that q_2^* strictly decreases in b_0 by its construction in Steps 3 and 4. Given this, the same payoff argument as in the final part of Step 4 shows that the DM's expected payoff strictly decreases in b_0. Plainly, the agent's interim expected payoff is weakly smaller for all $\mathbf{b}$ and strictly so for some $\mathbf{b}$ when b_0 is larger.

PROOF OF THEOREM 2:

For case (b), where $\tilde{F}_i$ is a degenerate distribution at zero, the conclusions of the theorem follow from the observations that if $\mathbb{E}[\tilde{b}_j] < b_0$ then $\tilde{\mathbf{q}}^* = \mathbf{0}$, and if $\mathbb{E}[\tilde{b}_j] \geq b_0$ then $\mathbf{q}^* = \mathbf{1}$ because $F_j = \tilde{F}_j$. So assume for the rest of the proof that $\tilde{F}_i$ is not degenerate, i.e. case (a) applies. The theorem holds trivially if $\tilde{\mathbf{q}}^* = \mathbf{0}$, so also assume $\tilde{\mathbf{q}}^* > \mathbf{0}$, hence $\tilde{\mathbf{q}}^* = (1, \tilde{q}_2^*) \gg \mathbf{0}$. Let $\mathbf{b}$ and $\tilde{\mathbf{b}}$ be the random vectors of the project values corresponding to $\mathbf{F}$ and $\tilde{\mathbf{F}}$, respectively. First, suppose $i = 1$ and $\underline{b}_1 \geq \tilde{q}_2^* \bar{b}_2$. Then, by strong ordering, it is clear that $\mathbf{q}^* > \tilde{\mathbf{q}}^*$: one one just raises the second component of the acceptance vector as high as possible so long as it remains optimal for the DM to accept project two when recommended.

So assume now that either $i = 2$ or $\underline{b}_1 < \tilde{q}_2^* \overline{b}_2$. Then, we claim that for $m \in \{1, 2\}$,

$$\text{(A2)} \qquad \mathbb{E}[b_m | \tilde{q}_m^* b_m = \max_{k \in \{1,2\}} \tilde{q}_k^* b_k] \geq \mathbb{E}[\tilde{b}_m | \tilde{q}_m^* \tilde{b}_m = \max_{k \in \{1,2\}} \tilde{q}_k^* \tilde{b}_k].$$[41]

For $m = i$, inequality (A2) follows from the likelihood-ratio dominance hypothesis, since $\tilde{F}_j = F_j$. For $m = j$, the argument for inequality (A2) is as follows. Define $y := \tilde{q}_i^* / \tilde{q}_j^*$. Then, we can write $\mathbb{E}[b_j \mid \tilde{q}_j^* b_j = \max_{k \in \{1,2\}} \tilde{q}_k^* b_k] = \int_0^\infty b k_j(b) db$, where $k_j(z) := F_i(\frac{z}{y}) f_j(z) / \int_0^\infty F_i(\frac{\tilde{z}}{y}) f_j(\tilde{z}) d\tilde{z}$. Likewise, $\mathbb{E}[\tilde{b}_j \mid \tilde{q}_j^* \tilde{b}_j = \max_{k \in N} \tilde{q}_k^* \tilde{b}_k] = \int_0^\infty b \tilde{k}_j(b) db$, where $\tilde{k}_j(z) := \tilde{F}_i(\frac{z}{y}) f_j(z) / \int_0^\infty \tilde{F}_i(\frac{\tilde{z}}{y}) f_j(\tilde{z}) d\tilde{z}$. It suffices to show that the cumulative distribution with density k_j likelihood-ratio dominates that with density $\tilde{k}_j$. Note that k_j has support $[\max\{y\underline{b}_i, \underline{b}_j\}, \overline{b}_j]$, and $\tilde{k}_j$ has support $[\max\{y\tilde{\underline{b}}_i, \underline{b}_j\}, \overline{b}_j]$, where $\tilde{\underline{b}}_i$ is the infimum of the support of $\tilde{f}_i$. Since F_i likelihood-ratio dominates $\tilde{F}_i$, $\underline{b}_i \geq \tilde{\underline{b}}_i$. Hence, it suffices to show that $\frac{k_j(b')}{\tilde{k}_j(b')} \geq \frac{k_j(b)}{\tilde{k}_j(b)}$ for any b and b' such that $\max\{y\underline{b}_i, \underline{b}_j\} < b < b' < \overline{b}_j$. By the definitions of k_j and $\tilde{k}_j$, this is equivalent to showing that $\frac{F_i(z')}{\tilde{F}_i(z')} \geq \frac{F_i(z)}{\tilde{F}_i(z)}$ for any z and z' such that $\max\{\underline{b}_i, \frac{\underline{b}_j}{y}\} < z < z' < \frac{\overline{b}_j}{y}$. But this condition holds if F_i dominates $\tilde{F}_i$ in reverse hazard rate, which is indeed the case as F_i likelihood-ratio dominates $\tilde{F}_i$.

Given that we have established inequality (A2), it now follows that $\mathbf{q}^* \geq \tilde{\mathbf{q}}^*$: strong ordering of $\mathbf{F}$ combined with (A2) for each $m \in \{1, 2\}$ implies that there is a weakly larger equilibrium in $\mathbf{F}$ than $\tilde{\mathbf{q}}^*$ (one just raises the second component of the acceptance vector as high as possible so long as it remains optimal for the DM to accept project two when recommended).

For the second part of the theorem, assume $\mathbf{0} < \tilde{\mathbf{q}}^* < \mathbf{1}$, for if not the conclusion is trivial. So $\tilde{q}_2^* \in (0, 1)$. The argument used above to prove (A2) also reveals that since the likelihood-ratio domination of F_i over $\tilde{F}_i$ is strict, k_j strictly likelihood-ratio dominates $\tilde{k}_j$, hence the inequality in (A2) must hold strictly for $m \in \{1, 2\}$. But then $\tilde{\mathbf{q}}^*$ cannot be an equilibrium in environment $\mathbf{F}$ because randomization would not be optimal for the DM following a recommendation of project two. It follows from the first part of the theorem that $\mathbf{q}^* > \tilde{\mathbf{q}}^*$.

PROOF OF THEOREM 4:

To identify the optimal simple mechanism, it is convenient to use the ratio $\theta := \frac{b_1}{b_2}$. Recall that $F(\cdot)$ and $f(\cdot)$ are respectively the cdf and density for $\theta \in [\underline{\theta}, \overline{\theta}]$.

[41]It can be checked that these conditional expectations are well-defined given that either $i = 2$ or $\underline{b}_1 < \tilde{q}_2^* \overline{b}_2$.

The DM's problem is to choose a simple mechanism $(q_1, q_2) \in [0,1]^2$ to maximize

$$\Pi(q_1,q_2) = q_1\left(\int_{\hat\theta(q_1,q_2)}^{\overline\theta} A_1(\theta)f(\theta)d\theta\right) + q_2\left(\int_{\underline\theta}^{\hat\theta(q_1,q_2)} A_2(\theta)f(\theta)d\theta\right) + b_0, \tag{A3}$$

where $\hat\theta(q_1,q_2) := q_2/q_1$ while $A_1(\theta) := \mathbb{E}[b_1|b_1/b_2 = \theta] - b_0$ and $A_2(\theta) := \mathbb{E}[b_2|b_1/b_2 = \theta] - b_0$ are the DM's net benefits from choosing projects 1 and 2, respectively.

We first prove that $q_1 \geq q_2$ at any optimum. Suppose to the contrary that $q_1 < q_2$. For this to be optimal, the DM should not benefit from raising q_1 slightly, or

$$\begin{aligned} 0 \geq \frac{\partial \Pi(q_1,q_2)}{\partial q_1} &= \int_{\hat\theta}^{\overline\theta} A_1(\theta)f(\theta)d\theta + (\partial\hat\theta/\partial q_1)(q_2A_2(\hat\theta) - q_1A_1(\hat\theta))f(\hat\theta) \\ &= \int_{\hat\theta}^{\overline\theta} A_1(\theta)f(\theta)d\theta + (\partial\hat\theta/\partial q_1)(q_1 - q_2)b_0 f(\hat\theta), \end{aligned} \tag{A4}$$

where the second equality holds because

$$q_2A_2(\hat\theta) - q_1A_1(\hat\theta) = \mathbb{E}[q_2b_2 - q_1b_1|b_1/b_2 = \hat\theta = q_1/q_2] + (q_1 - q_2)b_0 = (q_1 - q_2)b_0.$$

The second term of (A4) is positive since $q_1 < q_2$ and $\partial\hat\theta/\partial q_1 < 0$. This means that $\int_{\hat\theta}^{\overline\theta} A_1(\theta)f(\theta)d\theta < 0$. But then

$$\begin{aligned} &\int_{\underline\theta}^{\hat\theta} A_2(\theta)f(\theta)d\theta = F(\hat\theta)\left(\mathbb{E}[b_2 - b_0|b_1/b_2 < \hat\theta]\right) \leq F(\hat\theta)\left(\mathbb{E}[b_2 - b_0|b_1/b_2 < 1]\right) \\ &< F(\hat\theta)\left(\mathbb{E}[b_1 - b_0|b_1/b_2 > 1]\right) \leq F(\hat\theta)\left(\mathbb{E}[b_1 - b_0|b_1/b_2 > \hat\theta]\right) = \frac{F(\hat\theta)}{1 - F(\hat\theta)}\int_{\hat\theta}^{\overline\theta} A_1(\theta)f(\theta)d\theta < 0, \end{aligned}$$

where the two weak inequalities are because of (R2) and $\hat\theta = q_2/q_1 > 1$, and the strict inequality is by (R1). It follows that $\Pi(q_1, q_2)$ is maximized at $\mathbf{q} = \mathbf{0}$, a contradiction.

Since $q_1 \geq q_2$, we can let $q_2 = q_1\hat\theta$ for some $\hat\theta \in [0,1]$ and accordingly transform the DM's problem from (A3) to one of choosing $(q_1, \hat\theta) \in [0,1]^2$ to maximize

$$\Pi^*(q_1,\hat\theta) := \Pi(q_1, q_1\hat\theta) = q_1\left(\int_{\hat\theta}^{\overline\theta} A_1(\theta)f(\theta)d\theta + \hat\theta\int_{\underline\theta}^{\hat\theta} A_2(\theta)f(\theta)d\theta\right) + b_0. \tag{A5}$$

Since this objective function is linear in q_1, there is always an optimal solution with either $q_1^c = 1$ or $q_1^c = 0$ (in the latter case, it immediately follows that $q_2^c = 0$); moreover, $q_1^c < 1$ can be optimal only if the term in parentheses in (A5) is nonpositive for all $\hat{\theta}$.

Differentiate $\Pi^*(q_1, \hat{\theta})$ with respect to $\hat{\theta}$ to obtain

$$\frac{\partial \Pi^*(q_1,\hat{\theta})}{\partial \hat{\theta}} = \left[\int_{\underline{\theta}}^{\hat{\theta}} A_2(\theta) f(\theta) d\theta - \left(A_1(\hat{\theta}) - \hat{\theta} A_2(\hat{\theta})\right) f(\hat{\theta})\right] q_1$$

$$= \left[\int_{\underline{\theta}}^{\hat{\theta}} A_2(\theta) f(\theta) d\theta + (1-\hat{\theta}) b_0 f(\hat{\theta})\right] q_1, \tag{A6}$$

where the second equation follows from the observation that for any θ,

$$A_1(\theta) - A_2(\theta)\theta = \mathbb{E}[b_1 - \theta b_2 | b_1/b_2 = \theta] - (1-\theta) b_0 = -(1-\theta) b_0. \tag{A7}$$

Suppose first $\mathbf{q}^* = \mathbf{1}$. Then, $\mathbb{E}[b_1|b_1/b_2 \geq 1] > \mathbb{E}[b_2|b_1/b_2 \leq 1] \geq b_0$ (the strict inequality is by (R1)), hence the expression in parentheses in (A5) is strictly positive at $\hat{\theta} = q_2^* = 1$. Therefore any maximizer of (A5) has $q_1^c = 1$. Further, for any $\hat{\theta} \leq 1$, the second term of (A6) is clearly nonnegative; the first term is also nonnegative because

$$\int_{\underline{\theta}}^{\hat{\theta}} A_2(\theta) f(\theta) d\theta = F(\hat{\theta}) \left(\mathbb{E}[b_2 - b_0 | b_1 \leq \hat{\theta} b_2]\right) \geq F(\hat{\theta}) \left(\mathbb{E}[b_2 - b_0 | b_1 \leq b_2]\right) \geq 0,$$

where the first inequality holds since $\mathbb{E}[b_2|b_1 \leq \hat{\theta} b_2] \geq \mathbb{E}[b_2|b_1 \leq b_2]$ by (R2) and $\hat{\theta} \leq 1$, and the second inequality holds because $\mathbb{E}[b_2|b_1 \leq b_2] \geq b_0$. Hence, the DM's objective is nondecreasing in $\hat{\theta}$. So, if there is some $\hat{\theta}^* < 1$ such that $\hat{\theta} = \hat{\theta}^*$ is optimal, it must be that (A6) is zero for all $\hat{\theta} \in (\hat{\theta}^*, 1)$. But this implies that $f(\cdot) = 0$ on $(\hat{\theta}^*, 1)$, which is not possible because the support of θ is an interval by Assumption (A1). Therefore, the only optimum is $\hat{\theta} = 1$, and consequently $\mathbf{q}^c = \mathbf{1}$ is the unique optimizer in this case.

Next, assume $\mathbf{q}^* < \mathbf{1}$. To show that $\mathbf{q}^c < \mathbf{1}$, assume, to contradiction, that $\mathbf{q}^c = 1$ is optimal. Then $q_1 = 1$ and $\hat{\theta} = 1$ maximize (A5). Since $\hat{\theta} = 1$, the second term of (A6) is zero and the first term is strictly negative because $\int_{\underline{\theta}}^1 A_2(\theta) f(\theta) d\theta = F(1) \left(\mathbb{E}[b_2 - b_0 | b_1 \leq b_2]\right) < 0$, where the strict inequality is because $F(1) > 0$ and $\mathbb{E}[b_2|b_2 \geq b_1] < b_0$ (since $\mathbf{q}^* < \mathbf{1}$). Hence (A6) is strictly negative for $\hat{\theta} = 1$ and $q_1 = 1$, which implies that the value of (A5) can be strictly increased by lowering $\hat{\theta}$, a contradiction.

Finally, assume $\mathbf{1} > \mathbf{q}^* > \mathbf{0}$. Then $1 = q_1^* > q_2^* > 0$ by Theorem 1. Since in the best cheap-talk equilibrium, the DM is indifferent between the outside option and project two when the latter is recommended, the DM's expected payoff in the best cheap-talk equilibrium is the same as it would be if she always adopted a recommended project (keeping fixed the agent's strategy), which is

$\mathbb{E}\left[b_1 \cdot \mathbb{1}_{\{b_i > q_2^* b_2\}} + b_2 \cdot \mathbb{1}_{\{b_1 < q_2^* b_2\}}\right]$. It follows that

$$\Pi^*(1,1) = \mathbb{E}\left[\max\{b_1, b_2\}\right] > \mathbb{E}\left[b_1 \cdot \mathbb{1}_{\{b_i > q_2^* b_2\}} + b_2 \cdot \mathbb{1}_{\{b_1 < q_2^* b_2\}}\right] \geq b_0, \tag{A8}$$

where the first inequality is because $q_1^* > q_2^*$, and the second inequality is because the DM's ex-ante utility in a cheap-talk equilibrium cannot be lower than b_0. (A8) implies that the term in the parentheses of (A5) must be strictly positive at an optimum, hence the optimal $q_1 = 1$. Next, observe that for any $\hat{\theta} \leq q_2^* < 1$, the first term of (A6) is nonnegative since

$$\int_{\underline{\theta}}^{\hat{\theta}} A_2(\theta) f(\theta) d\theta = F(\hat{\theta}) \left(\mathbb{E}[b_2 - b_0 | b_1 \leq \hat{\theta} b_2]\right) \geq F(\hat{\theta}) \left(\mathbb{E}[b_2 - b_0 | b_1 \leq q_2^* b_2]\right) = 0,$$

where the final equality is from the DM's indifference condition for $q_2^* \in (0,1)$, and the inequality is because $\mathbb{E}[b_2 | b_1 \leq \hat{\theta} b_2] \geq \mathbb{E}[b_2 | b_1 \leq q_2^* b_2]$ by strong ordering and $\hat{\theta} \leq q_2^*$. Moreover, the second term of (A6) is nonnegative for all $\hat{\theta} \leq q_2^*$ and strictly positive if $f(\hat{\theta}) > 0$. It follows that no $\hat{\theta} < q_2^*$ can be optimal, because that would require $f(\cdot) = 0$ on some interval strictly within the support. Finally, if $f(q_2^*) > 0$, it also follows that the optimal $\hat{\theta} > q_2^*$.

PROOF OF LEMMA 4:

See online Appendix B.

PROOF OF THEOREM 5:

Assume $\mathbf{q}^* > \mathbf{0}$. Theorem 1 (part 2) has established that the DM's expected utility from any cheap-talk equilibrium $\mathbf{q}$ is is no larger than that from $\mathbf{q}^*$, so it suffices to show that delegation is weakly preferred to $\mathbf{q}^*$, and strictly so if $\mathbf{q}^* < \mathbf{1}$. If $\mathbf{q}^* = \mathbf{1}$, then the outcome of delegation is identical to that of $\mathbf{q}^*$ and the result is trivially true. For $\mathbf{q}^* < \mathbf{1}$, the result follows from the argument in the proof of Theorem 4 that yielded (A8).

PROOF OF THEOREM 6:

See online Appendix B.